Issued December 23, 1908.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF CHEMISTRY—BULLETIN No. 84, PART V.

H. W. WILEY, CHIEF OF BUREAU.

INFLUENCE OF FOOD PRESERVATIVES AND ARTIFICIAL COLORS ON DIGESTION AND HEALTH.

V.—FORMALDEHYDE.

By H. W. WILEY, M. D.,

WITH THE COLLABORATION OF W. D. BIGELOW, F. C. WEBER, AND OTHERS.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1908.

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Chemistry,
Washington, D. C., March 26, 1908.

Sir: I have the honor to transmit for your approval the results of the investigations which have been made in this Bureau to determine the effects of formaldehyde on digestion and health. The work is a continuation of that reported in Parts I, II, III, and IV of Bulletin 84, dealing, respectively, with boric acid and borax; salicylic acid and salicylates; sulphurous acid and sulphites, and benzoic acid and benzoates, and I recommend that this investigation be published as Part V of that bulletin.

As in the previous investigations, the analyses of the foods and feces were made under the supervision of W. D. Bigelow, Chief of the Division of Foods; the microscopic examinations were conducted by B. J. Howard, while the urinalyses, the study of the body weight, and the conduct of the food table were under the supervision of F. C. Weber. Acknowledgment is also due to the Bureau of Statistics for the valuable aid rendered in calculating and compiling the analytical data.

Respectfully,

H. W. Wiley, *Chief of Bureau.*

Hon. James Wilson,
Secretary of Agriculture.

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V.—FORMALDEHYDE.

INTRODUCTION.

Formaldehyde is one of those preservatives the use of which in foods has been almost universally condemned by experts, physicians, and the general public. Nevertheless, as formaldehyde has heretofore been used to quite an extent in certain foods, especially dairy products, and is still advertised under its own and other names for use in such products to a limited extent, it seemed wise to include this substance in the plan of investigation.

Formaldehyde is derived from the first member of the alcohol group, namely, methyl or wood alcohol. Each of the alcohols has an aldehyde corresponding thereto, as, for instance, formaldehyde from methyl alcohol, acetaldehyde derived from ethyl alcohol, which is the ordinary alcohol of commerce, and so on with the other alcohols. It has been very generally believed that the toxicity of alcohols, and they are more or less toxic, was greater as the series ascended—that is, if methyl or ethyl alcohol is considered as the basis of comparison the toxicity of the higher alcohols (such as butyl, propyl, and amyl) is greater than that of methyl or ethyl alcohol. Following this plan of classification the toxicity of methyl alcohol should be less than that of ethyl alcohol. There is a lack of exact experimentation on this point, but the evidence which has lately been secured leads to the conclusion that some modification of this common belief is necessary. The degree of toxicity of methyl and ethyl alcohol in small amounts is largely in favor of the methyl alcohol, while if relatively larger quantities are employed the methyl alcohol is far more toxic than the ethyl alcohol, and, as a corollary from this, formaldehyde under the same conditions should be more toxic than acetaldehyde. Attention should also be called to the fact that formaldehyde represents the simplest form of aldehyde known—that is, its chemical constitution shows that it is made up of carbon and water. By multiplying the simple molecule, for instance, by six the ordinary formula for a sugar is obtained. In other words, if a chemist could start with six molecules of formaldehyde and put

them together in a strictly natural way, he would produce sugar, which is a highly nutritious food in respect of its power to furnish heat, energy, and fatty tissue.

Physiological botanists suppose that formaldehyde is the first product of chemical synthesis, tending to build up the cellulose, or woody tissue of plants, and forming by condensation the starch and sugar which the plant contains. Its biological activity is supposed by some physiologists to extend even further, so as to be a very important aid in the building up of nitrogenous tissues. In this connection it must be remembered that formaldehyde not only possesses to a marked degree the property of combining with itself to form new bodies, but, as has already been suggested, it unites in a very intimate manner with the proteids. Therefore, when added to milk, which contains a very large proportion of nitrogenous materials, formaldehyde may enter into a chemical combination with these substances. To determine whether any difference would be observed in the activity of the preservative under these conditions, the formaldehyde was administered immediately after it was mixed with milk and also after allowing it to stand for forty-eight hours in contact with the milk. This length of time gave ample opportunity for the completion of any chemical reactions which the formaldehyde might undergo in connection with the protein substances.

Another point which was carefully considered was that presumably, in the case of formaldehyde, we are dealing with a substance universally considered to be of a poisonous character, and for this reason much more care was necessarily exercised in regulating the quantity administered in order that no sudden or unexpected toxic effects might be produced.

Another fact worthy of consideration is that inasmuch as milk is the most prone of all ordinary foods to deterioration and requires the most careful treatment, the temptation to use such an efficient preservative as formaldehyde is proportionately greater, especially during the summer months. The arguments which have been advanced in favor of other preservatives in small quantities should theoretically carry more weight in the case of milk than of other common foods, and if these arguments are valid in any case, they would be especially so when applied to dairy products. It is generally admitted that there is no known preservative so effective, so readily employed, and in some respects so likely to escape detection, as minute quantities of formaldehyde, and, therefore, all the conditions which relate to its use deserve the greater care and consideration. It should not be forgotten, however, that a supposititious commercial necessity can not be cited as an excuse for the addition to foods of substances which are injurious.

In this connection it seems not out of place to call attention to the fact that apart from the injurious effects of formaldehyde itself, its use as a preservative would be especially inadvisable in milk or cream because its addition in dilute solution prevents the growth of acid-forming bacteria, but has no effect in retarding the action of many harmful organisms; in other words, the milk is prevented from becoming sour and thus indicating its age and the danger signal is thus removed, while the other organisms which are capable of producing disease continue to multiply in the milk with practically the same degree of rapidity as if the formaldehyde were not present.

Attention is again called to the proper and legitimate signification of the term "injurious to health," when used in this connection. This phrase does not signify that a food which has an injurious substance added to it must in every instance produce notably injurious effects upon the consumer immediately. The question can only be logically and fairly studied by considering the continued or cumulative effects, nor are these necessarily of such a character as to result in objective symptoms. Insidious effects which are produced on the cells of the organs or on their histological structure are no less important; in fact, they are more important. These are the injuries which at first escape detection and may go to irremediable lengths before any outward symptoms of their existence are manifested.

All of these points have been kept in view in the consideration of this question, but none of them has had any influence on the observation and recording of the data. As in all other cases, this part of the work has been conducted absolutely without reference to any preconceived theory. The sole endeavor has been to control the quantity and quality of the food, the nutritive value of the ration, and the course of life of the subject, and to record the effect observed on the health and the metabolic processes in general. This work has been distributed among a large number of observers, each having control of a particular part of the investigation and working independently. In this case, as in all of the others, it was not until the figures were collated, tabulated, and studied that the tendencies induced by the preservative were known, and not until then could any attempt be made to determine the general effects or to draw conclusions from the data.

While it is not to be expected that the mass of compiled figures presented are absolutely free from error, the general effects which were produced are unmistakable, and it is believed the conclusions drawn therefrom are deduced on sound principles of reasoning, and are based on reliable data, the marked uniformity of the analytical results and the absence of contradiction in the individual data being especially marked in this experiment.

SERIES IX.

ADMINISTRATION OF THE PRESERVATIVE.

SCHEDULE OF ADMINISTRATION.

This series of investigations was begun on the 12th of November 1904, and concluded on the 17th of December, 1904. The fore period covers ten days of observation, the preservative period fifteen days, and the after period ten days. The dates of the several subperiods are given in Table I.

TABLE I.—*Dates of periods and subperiods, Series IX.*

Period and subperiod.	Date of beginning.	Date of ending.
	1904.	1904.
Fore period	Nov. 12	Nov. 21
First subperiod	....do...	Nov 16
Second subperiod	Nov. 17	Nov. 21
Preservative period	Nov. 22	Dec. 6
First subperiod	....do...	Nov. 26
Second subperiod	Nov. 27	Dec. 1
Third subperiod	Dec. 2	Dec. 6
After period	[a]Dec. 8	Dec. 17
First subperiod	....do...	Dec. 12
Second subperiod	Dec. 13	Dec. 17

[a] In tabulating the results the data for December 7 are omitted owing to the fact that the preservative was administered only on the morning of that day, and it was then deemed advisable on account of the condition of the subjects to begin the after period.

Table II shows the administration of the formaldehyde during the preservative period. The quantity given daily during the first preservative subperiod is 100 milligrams, during the second preservative subperiod 200 milligrams, and during the third preservative subperiod 200 milligrams, making a total of 2.5 grams administered during the entire preservative period.

TABLE II.—*Schedule of administration of preservative, Series IX.*

Period and date (1904).	Formaldehyde added to milk immediately before taking.						Formaldehyde added to milk two days before taking.[a]				
	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.	No.10.	No.11	No.12.
First subperiod:	*Grms.*	*Grms.*	*Grms.*	*Grms.*	*Grms.*	*Grms.*	*Grms.*	*Grms.*	*Grms.*	*Grms.*	*Grms.*
Nov. 22	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
23	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
24	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
25	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
26	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
Total	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5

[a] No. 9 left the city before the entire observation was completed and therefore his data are omitted.

TABLE II.—*Schedule of administration of preservative, Series IX*—Continued.

Period and date (1904).	Formaldehyde added to milk immediately before taking.						Formaldehyde added to milk two days before taking.				
	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.	No. 10.	No. 11.	No. 12
Second subperiod:	*Grms.*	*Grms.*	*Grms.*	*Grms.*	*Grms.*	*Grms.*	*Grms.*	*Grms.*	*Grms.*	*Grms.*	*Grms.*
Nov. 27	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
28	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2
29	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2
30	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2
Dec. 1	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2
Total	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Third subperiod:											
Dec. 2	.2	.2	.2	.2	.2	.2	.2	.1	.2	.2	.2
3	.2	.2	.2	.2	.2	.2	.2	.0	.2	.2	.2
4	.2	.2	.2	.2	.2	.2	.2	.0	.2	.2	.2
5	.2	.2	.2	.2	.2	.1	.2	.0	.1	.2	.2
6	.2	.2	.2	.2	.2	.0	.2	.0	.0	.2	.2
Total [a]	1.0	1.0	1.0	1.0	1.0	.7	1.0	.1	.7	1.0	1.0

[a] On Dec. 7 those subjects who were still receiving the preservative were given 0.1 gram, but it was deemed inadvisable to continue the preservative period for another five days, and the after period was accordingly begun on Dec. 8, the data for Dec. 7 being disregarded in the tabulations.

It will be noted that only Nos. 6, 8, and 10 failed to take the scheduled amount of preservative. No. 8 received the smallest amount, taking only 0.1 gram on the first day of the last subperiod and none thereafter, while Nos. 6 and 10 took only 0.1 gram on the next to the last day of the preservative period and none on the last day, making a total for the subperiod of 0.7 gram.

METHOD OF ADMINISTRATION.

An aqueous solution of formaldehyde was administered in milk. The strength of a stock solution was determined from time to time and the proper volume to secure the amount required by the schedule was added to the milk taken by the subjects. On account of the liquid nature of this substance it was not possible to administer it in any better way. The quantity added in the first subperiod was not sufficient to impart any taste to the milk, but in the larger quantities a slightly disagreeable taste was noticeable. In the case of half of the men (Nos. 1 to 6) the preservative was added to the milk immediately before it was drunk; and in order that ample time might be given for any chemical union which might take place between the formaldehyde and the protein constituents of the milk, that administered to Nos. 7 to 12 was added to the milk two days before consumption.

DAILY MEDICAL AND CLINICAL NOTES.

All the men who became members of the table for testing the effects of formaldehyde on health and digestion were carefully examined before the beginning of the experiment, as in previous cases. The medical history of each man was ascertained, no one being admitted who was not free from organic disease or who had suffered

from serious illness of any kind within a year or two, who was predisposed to any hereditary malady, or who exhibited any feebleness of constitution which would make him an easy victim to disease. The usual daily examinations were made of each man, the temperature, pulse, and body weight being recorded. When any variation from the normal was noticed, the observation was checked by an attendant, who was always present and supervised the securing of the data for the clinical and medical history; and any symptoms reported were carefully considered, to determine how far such disorders might be attributed to the use of the preservative.

INDIVIDUAL DATA.

No. 1.

At the beginning of the fore period No. 1 was normal in all respects. The temperature was slightly below the average, while the average pulsation was 70 beats per minute. No. 1 passed through the fore period without any notable variation from the normal. On November 18 the temperature was slightly higher, namely, 98.6°, but fell the next day. On November 22, the first day of the preservative period, the temperature of No. 1 was 98.3° and his pulse 68 beats per minute. On the next day the temperature was slightly increased, namely, 98.6°. On the 24th he developed symptoms of headache, which, however, were not very severe and passed away the next day. The temperature was a little below the normal, falling one day to 98° and on another to 98.1°. On November 27 the temperature was only 97.9°. During the night of the 29th he was unable to sleep, and was restless, and this restlessness increased the next day, accompanied with a marked thirst. On the 3d of December a troublesome rash was developed over almost the whole of the chest, and the inability to sleep continued. The rash and the sleeplessness continued through December 4, and on the next day headache and soreness in the region of the abdomen were reported in addition to the other symptoms. On December 6 and through the first day of the after period these symptoms continued and the soreness in the region of the abdomen increased. On the second day and for the remainder of the after period, however, the unfavorable symptoms disappeared and the subject regained his usual state of health. The most pronounced effect of the preservative on No. 1 was the development of the rash upon the chest, soreness in the abdomen, headache, restlessness, and inability to sleep.

No. 2.

No. 2 began the experiment in a perfectly normal condition and developed no unfavorable symptoms of any kind during the fore period. He entered the preservative period in a normal state and no

symptoms of any kind were developed, except a decrease in temperature, until December 4, when a general feeling of malaise was reported. On December 5 a severe headache developed, with tenderness in the region of the liver, and constipation. A condition resembling incipient vertigo developed after breakfast on this day, lasting for about two hours. On the following day, however, these symptoms had disappeared and no further discomfort was experienced until December 8, the first day of the after period, when nausea and a slight headache were noted, the tenderness in the region of the liver continuing for several days after the close of the preservative period. On December 13 the symptoms of vertigo or dizziness and nausea recurred, but were of short duration. This fact would not necessarily indicate that the preservative was the cause of the disturbance, although it may have had some connection with their recurrence, since No. 2 was not subject to such attacks. The data as a whole, however, indicate that little or no effect is produced in the case of No. 2 by the administration of the formaldehyde.

No. 3.

No. 3 entered the fore period in an excellent state of health with temperature, pulse, and all the other functions of the body normal. No symptoms of a disturbing character were reported during the fore period, although the average temperature was slightly subnormal throughout the observation. No symptoms of an unfavorable nature were developed until the first day of the third preservative subperiod, when pain in the lumbar region and groin was reported, which lasted throughout the day. On the following day, December 3, the subject was nauseated for about an hour after breakfast and felt again a dull pain in the groin. On December 4 pain in the abdomen and back, and restlessness, accompanied with inability to sleep, were reported. At about 9 o'clock of this day the subject suffered from an attack of nausea, and the pains in the abdomen and the sleeplessness, together with headache, continued through the night. On the next day, December 6, there was soreness in the region of the stomach, and in the night the slight nausea and sleeplessness returned. All these symptoms except slight soreness in the region of the abdomen disappeared after the first day of the after period. This soreness lasted through December 9, but from that time on the subject reported himself in reasonably good condition. These data show the unmistakable effect of the formaldehyde in developing sleeplessness and a feeling of restlessness, soreness in the abdomen, pain in the lumbar region and groin, and headache. After the withdrawal of the formaldehyde these symptoms disappeared.

No. 4.

No. 4 was in good condition when entering the fore period, with normal temperature and pulse, which continued to the close of the period. On the first day of the preservative period his temperature registered 98.3° and his pulse 80 beats per minute. No unfavorable symptoms were developed, except a tendency to a somewhat lower temperature, until December 4. On this day slight pains in the abdomen accompanied by nausea and loss of appetite were reported. These symptoms practically disappeared on the following day, but on December 6 the headache returned, attended by a severe catarrhal cold, which continued throughout the next day, disappearing on the second day of the after period. From this time until the end of the observation the subject remained in a normal condition. From these data it is seen that No. 4 endured the action of the preservative for a period of time without apparent discomfort. There are then developed the symptoms of nausea, headache, and general malaise.

No. 5.

No. 5 entered the fore period with normal temperature and a somewhat accelerated pulsation of 84 beats. On the second day he developed a slight cold, which, however, was not attended by a rise in temperature. This cold grew worse, and on November 14 it was accompanied by headache and the temperature of the subject had risen to 100°, while the pulse was 104 beats per minute. On the next day the headache had disappeared, but the cold still continued and the subject was given 18 grains of quinine within twenty-four hours. In consequence his condition on the next day was improved, the temperature being normal. Again 18 grains were administered. Only a slight cough remained, and on the 17th he was entirely normal again, with no unfavorable conditions for the rest of the fore period. At the beginning of the preservative period the temperature and pulse of No. 5 were normal, and except for a slight decrease in temperature he continued in excellent condition until November 29. At this time he reported pains in the back, in the region of the kidneys. These, however, passed away the next day and no unfavorable symptoms appeared until December 4, when he suffered pain in the stomach during the night. On December 6 the pains in the back recurred, especially around the kidneys, with headache during the afternoon. The pains in the stomach returned on December 7; nevertheless the subject complained of being hungry. He entered the after period with normal temperature but with somewhat accelerated pulse. All unfavorable symptoms disappeared immediately on entering the after period until December 12, when the subject complained of feeling weak and ill. The remainder of the after period, however, passed without further unfavorable symptoms. The data in the case of

No. 5 show a remarkable toleration of the formaldehyde administered until toward the end of the preservative period, when pain in the stomach, the back, and the head were developed.

No. 6.

No. 6 began the fore period in a normal state in every particular, which condition continued until November 19, when a slight cold developed and his temperature rose to 99.4°. On November 20 the temperature was still high, registering 100.5°, pulse 100 beats per minute. The temperature on the following day was 1° above normal and 6 grains of quinine were administered. On November 22 the febrile disturbance and the rapid pulse had disappeared and no effects of the cold remained. This normal condition continued during the preservative period until November 29. During dinner on that day No. 6 was seized with severe cramps in the stomach. Three attacks occurred within an hour, but there was no disturbance either of temperature or of appetite. On December 1 the subject complained of dryness in the mouth and thirst, and on December 3 a dull headache lasting for several hours was reported. Soreness in the region of the stomach was developed on December 4, with a feeling of uneasiness which lasted the whole day. This soreness had increased greatly by the next day and a very severe headache had developed, so that it was deemed advisable to discontinue the administration of the preservative. On December 6 the rapidity of the heart action was noted. There was still soreness in the region of the stomach, but to a less degree, and in the evening a feeling of nausea was reported. On December 7, the second day after the cessation of the administration of the preservative for this subject, there was still a trace of soreness left in the stomach, and on the third day a slight headache. During the next two days the unfavorable symptoms disappeared, but on December 10 the soreness in the region of the stomach returned. On the two following days a dull headache was reported, which disappeared for a day and recurred again on December 14. On the 16th slight indigestion was experienced and on the 17th a headache lasting all day was recorded. This subject was not entirely restored to normal condition at the close of the after period. A general survey of the data of No. 6 shows the development in the latter part of the preservative period of abdominal soreness, nausea, and general malaise attended with headache; and these symptoms continued, though with decreasing intensity, throughout the after period.

No. 7.

No. 7 entered the fore period in normal condition as to temperature, pulse, and the general functions of the body. There was no disturbance of this state during the whole of the fore period, and

until the third day of the preservative period, when a feeling of nausea developed at about 7 p. m. which lasted two or three hours and was accompanied by a dry feeling in the mouth and throat. These symptoms passed away on the following day and did not recur again until November 27, when a burning sensation in the throat was reported on drinking the milk which contained the formaldehyde. On November 30 a rash appeared on the back and on the inside of the thighs, attended by considerable itching. This rash was similar in character to that developed in the case of No. 1, except as to location, and continued during the following days, being very irritating on the 5th, especially after going to bed. On December 6 pains were developed in the region of the stomach, lasting throughout the evening. On the second day of the after period the rash began to decrease, but on December 13 the lower part of the thigh was still much irritated. On December 15, while the rash still persisted, the irritation had almost ceased and on the last day of the after period the rash had practically disappeared. These data show the irritating effect of the formaldehyde in the last part of the preservative period, and especially do they indicate the tendency of the preservative to develop a rash upon the body, which in the case of No. 7 was extremely persistent.

No. 8.

No. 8 entered upon the fore period in a normal condition as to pulse, temperature, and general bodily functions, which condition continued without change during the whole of the fore period. On the second day of the preservative period, a slight soreness of the throat with a dry and parched feeling of the fauces is recorded, and these sensations continued on the following day. During the night of November 24, No. 8 was seized with severe pains in the lumbar region which disappeared on the following day but his throat was still sore and dry. Normal conditions appear to have been reestablished on November 26, but on the 27th there was a feeling of fullness in the head and the throat was again sore and dry. These symptoms were less marked on the following day; but on November 30 they returned with more force and a rash developed on the outer side of the thighs. The subject was restless during the night, unable to sleep, and found difficulty during the day in concentrating his mind upon study. The pains experienced are described as being of a dull character and accompanied by a feeling of fullness in the head. After eating, very severe pains developed in the abdomen which, however, lasted for only a quarter of an hour. On December 2, though only half the amount of preservative scheduled was taken (i. e., 0.1 gram), there was severe nausea after breakfast, the appetite disappeared, and at luncheon time the subject could not eat at

all. Thirst with continued headache was experienced all day and there was more or less rash on the arms as well as on the legs. The administration of the preservative was discontinued on December 3 but nausea was nevertheless developed after breakfast and lasted for about one hour and a half, being attended with considerable vomiting. The condition of No. 8 was becoming abnormal and his further participation in the experiment was abandoned. Later he underwent a successful operation for appendicitis at a local hospital. The data for this subject are accordingly excluded from the summaries, his individual data being submitted as a matter of record.

No. 9.

The data for No. 9 are omitted, as he left the city before the period of observation was completed, and they are therefore of no value.

No. 10.

No. 10 entered the fore period with normal temperature and pulse and with no evident disturbance of any of the functions of the body. There was no change in this condition during the entire fore period. The temperature on November 22 was 98.3° and the pulse 67. This normal condition continued through the first and second subperiods of the preservative period, and not until December 3 did the subject report any abnormal symptoms. On that day severe pains of the character of neuralgia developed in his face, which continued on the 4th and became so severe on the 5th that No. 10 was compelled to go to bed during the latter part of the day. On the 6th he returned to the table feeling generally ill, with temperature slightly above normal, severe headache, pains in the back, soreness in the stomach, and nausea. Nine grains of quinine were administered during the day. On the 7th the symptoms had somewhat improved, but the temperature was still slightly above normal at the beginning of the after period. The unfavorable symptoms, however, soon disappeared and normal conditions had returned by the middle of the after period which were maintained to the end of the observation. The data in this case show a fair tolerance of the administration of formaldehyde until toward the end of the preservative period, when a sudden illness occurred and the symptoms which have been noted in the other cases—headache, soreness in the stomach, nausea, and general malaise—were developed in a high degree. These symptoms, however, passed away rapidly after the withdrawal of the formaldehyde.

No. 11.

The functions of the body were entirely normal in the case of No. 11 at the beginning of the observation, the temperature being 98.3° and the pulse 74. These normal conditions continued without any

notable change, except slight variations in temperature and pulse, throughout the whole of the fore period. On November 22, No. 11 entered the preservative period with a temperature of 98.6° and a pulse of 82. All of the other functions of the body were as before. No disturbance of any kind, except a slight decrease in temperature, were noticed in the case of No. 11 until November 29, when chilly sensations in the lower extremities are recorded. On the next day itching of the skin developed in addition to the chilly sensations and a sore throat is recorded. The temperature was normal but the pulse was slightly accelerated. On December 1 the subject felt a burning sensation on the chest and about the knees. The temperature was normal, but at 4.30 p. m. a severe dull and heavy pain in the region of the heart developed. There was also a slight disturbance of the digestion, with belching. On the following day it was difficult for the subject to eat breakfast and he had no appetite at all for dinner. There was slight nausea, also pain, and the itching sensation much like that reported in the other cases, but without marked development of coloration. There seemed to be distinct effects produced upon the heart by the administration of the preservative. The temperature was below normal and the itching and burning about the body continued during December 3, also the sensation of chilliness in the lower extremities. On December 4 the itching became more pronounced, especially after eating, the sensation of cold continued, and on the following day a burning in the throat and a dull headache were added to the other symptoms. The itching and burning continued on December 6, although coloration had disappeared, and the headache also persisted. No. 11 entered upon the after period with temperature and pulse normal but with continued itching and burning of the skin, though these symptoms were not so well marked on the first day of the after period as on the last day of the preservative period. On the second day the sensation of cold in the lower extremities had almost disappeared and the burning and itching, the symptoms of rash, were much less pronounced, and on December 9 they had practically ceased, although the subject reported a slight itching sensation about the hips. By December 11 there was no trace of the symptoms of rash left, although slight indigestion with fermentation and belching was reported on this day. The normal condition was restored on December 13 and no further symptoms were developed except that, on the last day, No. 11 became nauseated after eating the oysters of the diet, and this nausea was repeated to some extent on the following day. These data show a marked development of the itching and burning of the skin, more severe than in the other two cases, although the coloration was not so pronounced.

No. 12.

No. 12 was in excellent physical condition at the beginning of the fore period, with temperature, pulse, and all the other functions of the body normal. This condition continued until early in the preservative period, when there appeared to be a slight depression of temperature. No symptoms of diagnostic value, however, were recorded until December 1, when marked pain in the intestines was experienced after dinner and continued till about midnight. On the third day thereafter, December 5, they recurred with greater intensity. Severe cramps in the stomach continued from 3.30 p. m. until midnight, especially on the right side of the stomach, and neuralgic pains developed in the face and head. On December 6 pains were experienced throughout the abdominal region, and on the next day, which was the beginning of the after period, the subject suffered from pain in the region of the kidneys. Restlessness, insomnia, and an itching sensation in the legs were recorded for the night of December 8, but these symptoms disappeared on the following day, and from this time until the end of the observation the subject was entirely normal. The data in this case show a considerable disturbance developed by the administration of the formaldehyde in the latter part of the preservative period manifested chiefly by abdominal pain, and during the after period as an itching sensation of the skin, recalling the itching sensation and rash experienced by the three other subjects during the administration of the formaldehyde.

DISCUSSION OF TEMPERATURE CHART.

The variations of temperature are a matter of special importance in this case inasmuch as there appears to be a tendency on the part of the preservative to depress the temperature of the body. This is shown in figs. 1 and 2, in which the variations in temperature from day to day are recorded for the three periods and also the average temperature for each period, represented as a straight line, in order to secure a better comparison. Though the average decrease is slight, the effect indicated is of interest and the problem presented will be further studied.

In the case of Nos. 1 and 3 only is there a slight increase in temperature in the preservative and after periods, while No. 11 shows no change throughout, and No. 10 no decrease until the after period. Nos. 2, 4, 5, 6, 7, and 12 show a decrease in temperature in the preservative period, and in the cases of Nos. 6, 7, and 10 the decrease is augmented in the after period. The summary for Nos. 1 to 6 shows an average decrease in temperature of 0.3° in the preservative period and an increase of 0.1° in the after period over the preservative period. The summary for Nos. 7, 10, 11, and 12 shows a de-

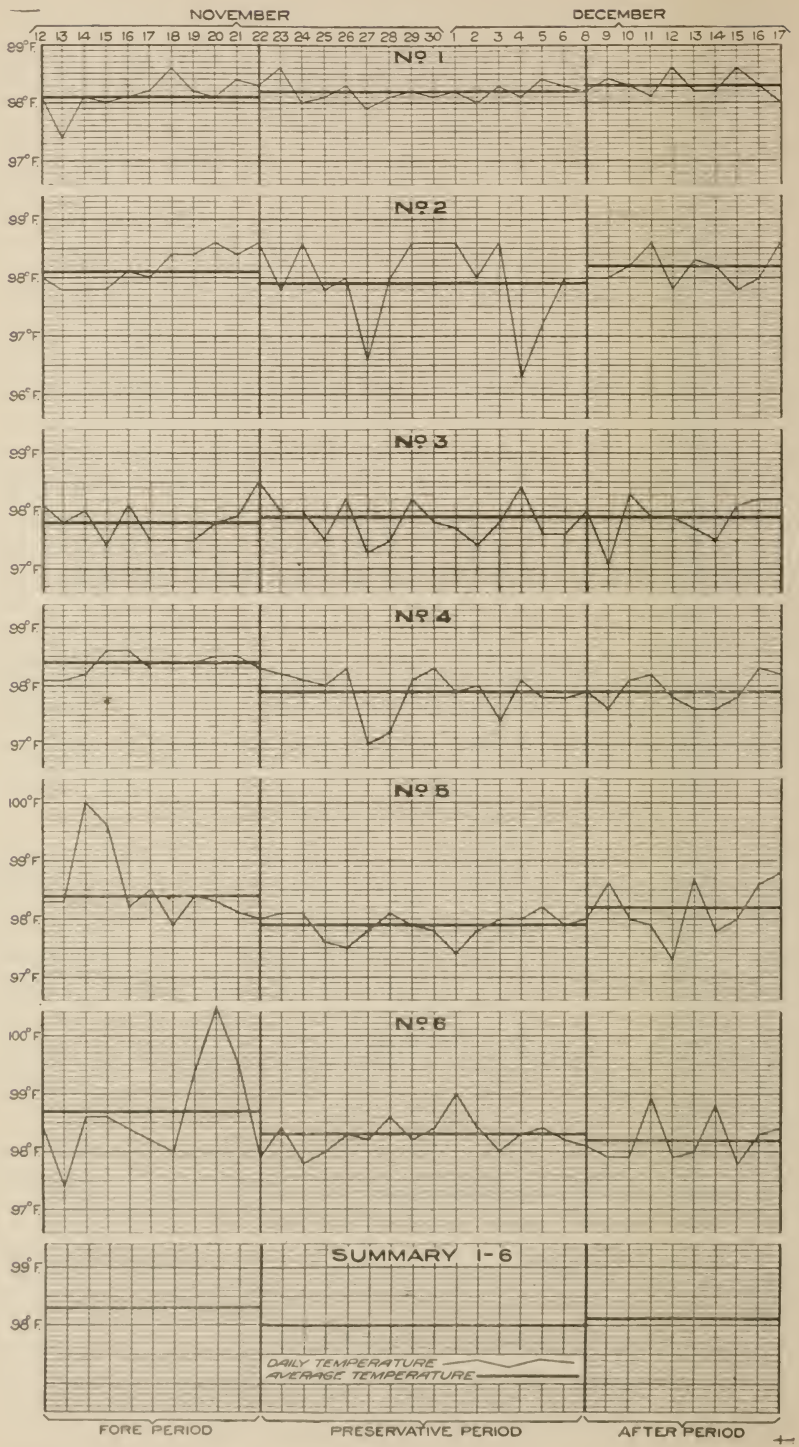

FIG. 1.—Daily and average temperature record for Series IX, Nos. 1 to 6, and summary.

crease of 0.1° in the preservative period and a further decrease of 0.2° in the after period, the general summary for all the individuals

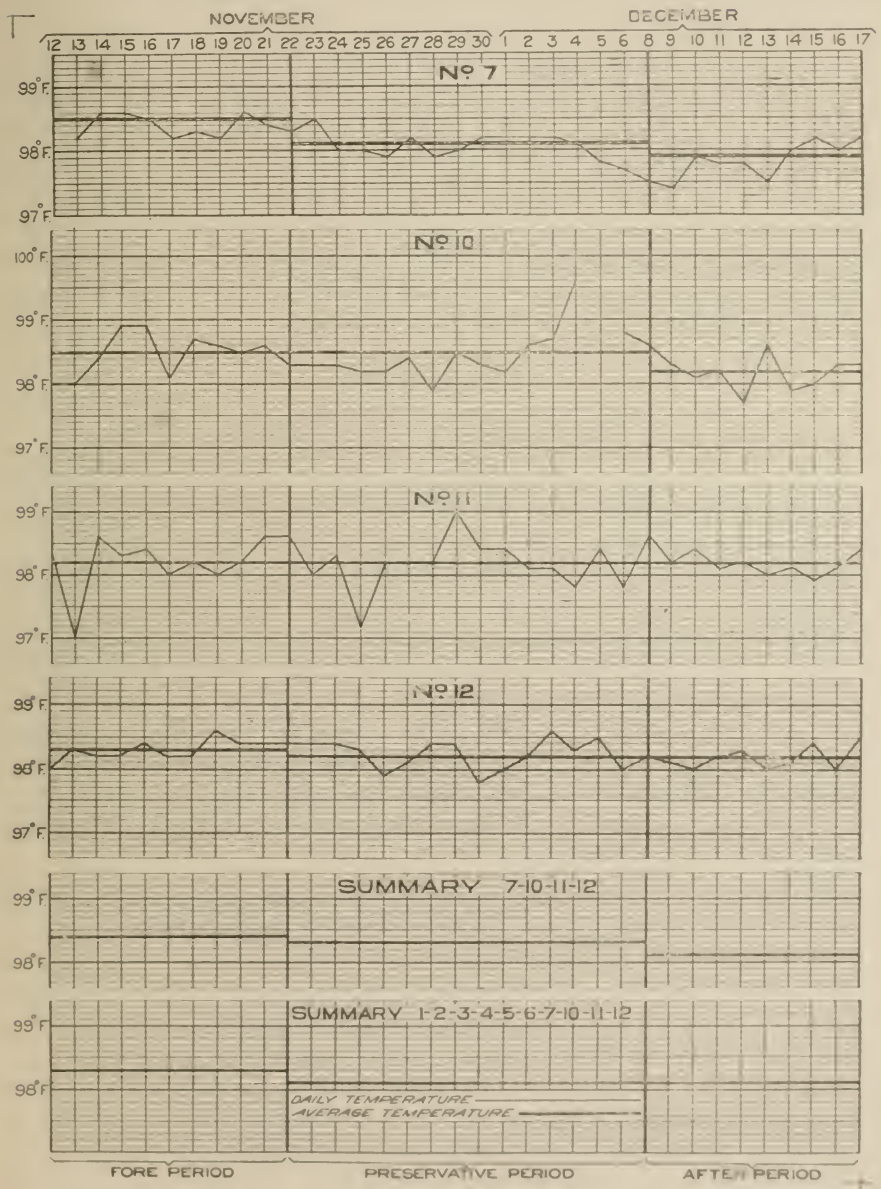

FIG. 2.—Daily and average temperature record for Series IX, Nos. 7 to 12, excluding Nos. 8 and 9, and summary, together with the general summary for the entire series.

giving a decrease of 0.2° in the preservative period and no further change in the after period.

CONCLUSIONS.

A general survey of the medical and clinical history shows that for about eight or ten days no abnormal symptoms of note were produced by the administration of formaldehyde. During the third preservative subperiod, however, pain in the stomach and intestines, often attended by cramps and sometimes by nausea and vomiting, occurred in all but two cases. In four cases out of eleven there appeared a well-marked rash on the chest and thighs, attended by itching and great discomfort. In a fifth case slight symptoms of this nature are recorded. The general symptoms, therefore, are headache and abdominal pains, while the tendency to lower the temperature is a minor symptom, and the development of a rash, though marked, occurs in only about half of the cases.

BODY WEIGHTS.

VARIATIONS IN BODY WEIGHTS.

Charts have been constructed (figs. 3 and 4) in which the daily variations of weight are recorded for each individual, the mean weight for each period being indicated by a straight line for the easier comparison of the effect produced in the three periods. Summaries for the men receiving the preservative under the same conditions are also given and a general summary for the entire series.

In the case of No. 1, it is seen that there is practically no change in the weight of the body throughout the observation, the total increase being negligible, i. e., 0.23 kilogram, or about one-half pound during a period of five weeks. The data for No. 2 show a very slight decrease in weight during the preservative period, and this decrease is repeated in the after period. The total decrease amounts to about 1 kilogram.

In the case of No. 3 there is again a decrease in weight of about half a kilogram during the preservative period, with practically no further change, as compared with the average, in the after period, the total average decrease in weight amounting to only 0.66 kilogram. The data for No. 4 show a negligible decrease in weight during the preservative period, there being practically no change. In the case of No. 5 there is a very slight increase in weight during the preservative period (0.18 kilogram), and this increase is repeated during the after period, the entire average gain amounting only to 0.29 kilogram.

In the case of No. 6 there is a slight decrease in weight during the preservative period of 0.58 kilogram, which is practically restored during the after period, The data for No. 7 show marked daily variations in weight during the preservative period, the average loss being only 0.17 kilogram, while a decided loss of weight takes

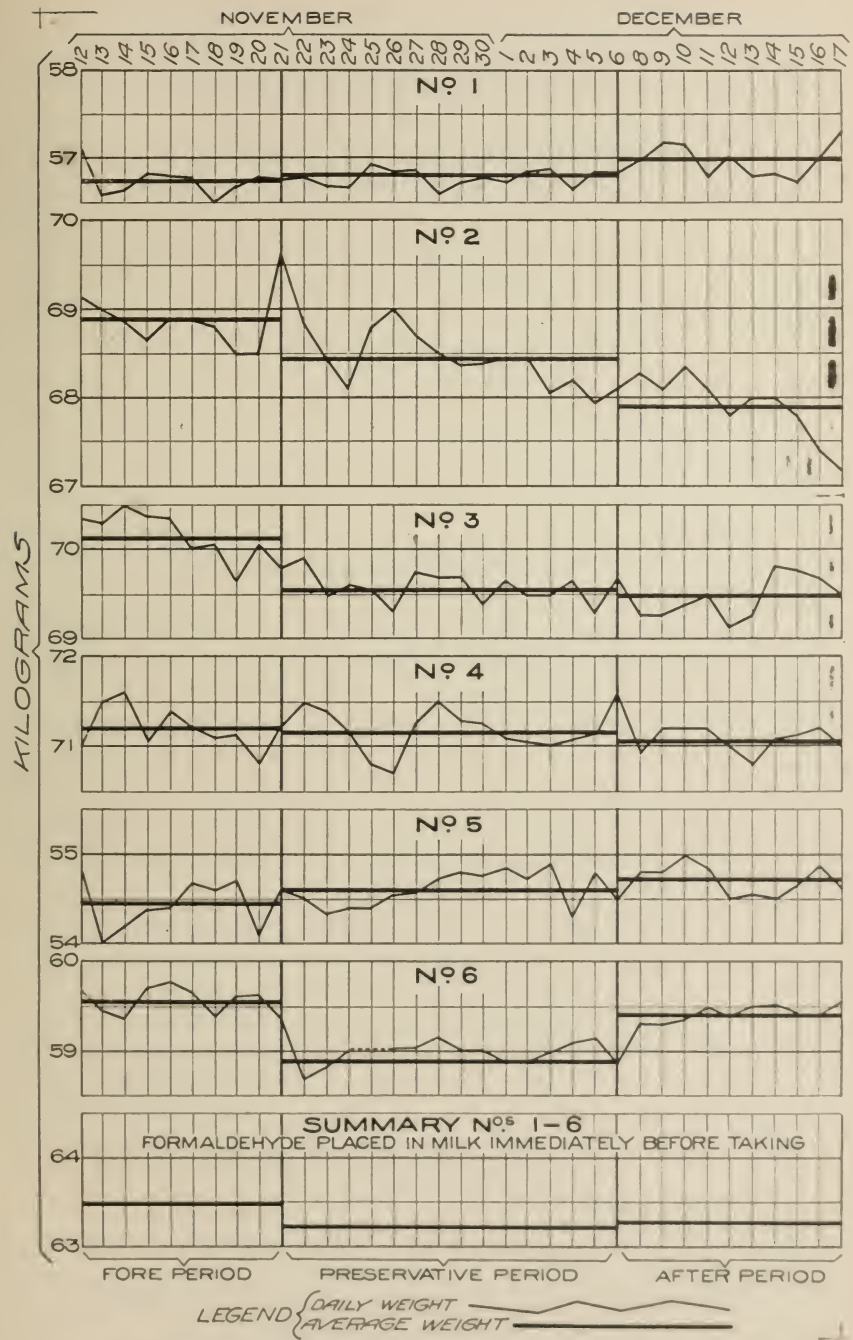

FIG. 3.—Daily and average body weights for Series IX, Nos. 1 to 6, and summary.

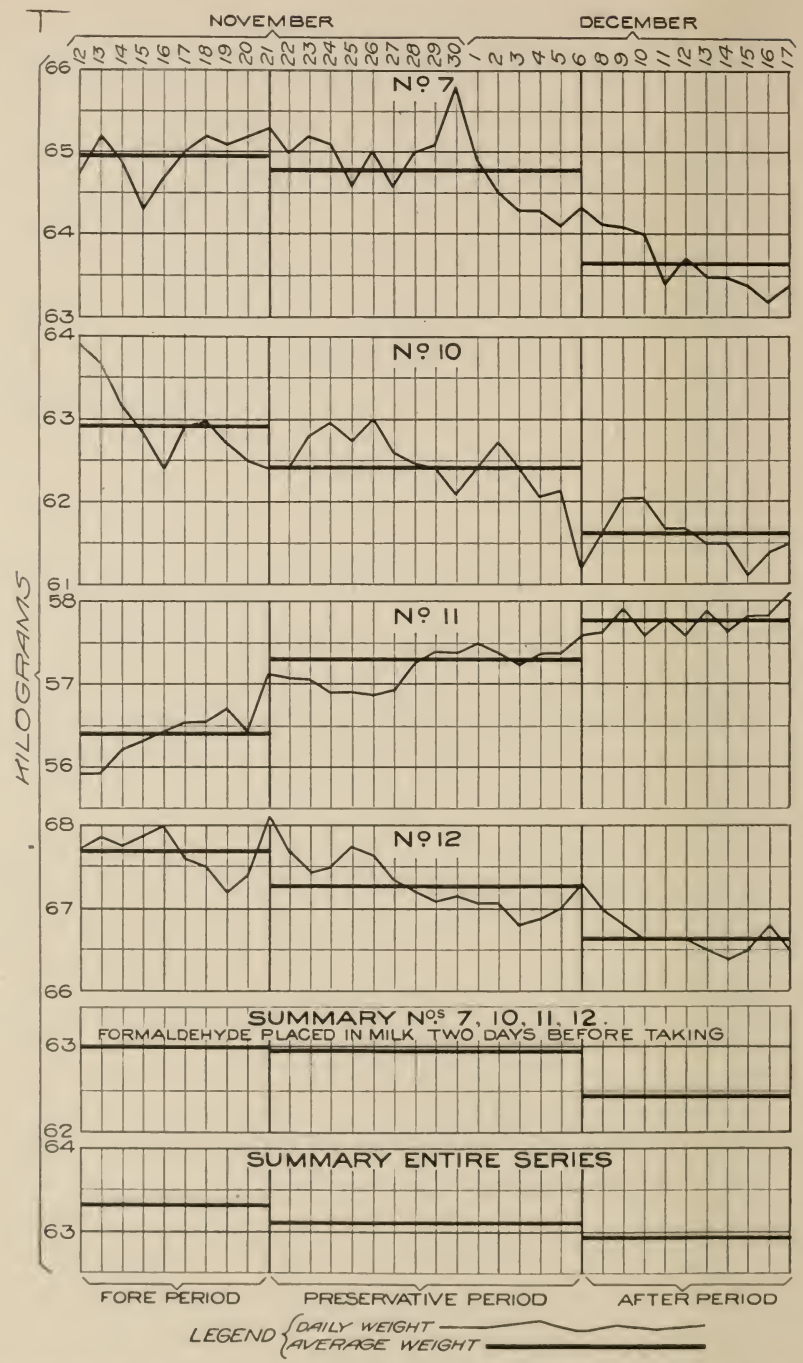

FIG. 4.—Daily and average body weights for Series IX, Nos. 7 to 12, excluding Nos. 8 and 9, and summary, together with the general summary for the entire series.

place during the after period, amounting to 1.15 kilograms, as compared with the preservative period.

The data for No. 8 are not charted, as the subject was obliged to withdraw from the experiment by reason of illness at the beginning of the third preservative subperiod; notwithstanding this an average gain of weight, amounting to 1.12 kilograms is recorded for the preservative period.

The data for No. 9 are not charted, as he left the city before the conclusion of the experiment. No. 10 shows a decrease in weight during the preservative period of half a kilogram, and this decrease is increased during the after period, the total average loss amounting to 1.32 kilograms.

No. 11 shows a marked increase of weight in the preservative period (almost 1 kilogram) and another increase of nearly half a kilogram in the after period. No. 12, on the other hand, shows a decrease of about half a kilogram in the preservative period and a still further decrease of 0.61 kilogram in the after period.

Though the individual data vary, some increasing and others decreasing in weight, the average weight for Nos. 1 to 6 for the three periods shows a slight decrease, amounting only to 0.23 kilogram during the preservative period, while there is practically no further change in the after period. These data are for the subjects to whom the formaldehyde was given immediately after mixing it with the milk.

In the general summary for Nos. 7, 10, 11, and 12 (who took milk which had been preserved with formaldehyde for two days), the average weights show a decrease during the preservative period so slight as to be practically negligible, while a decrease occurs in the after period amounting to half a kilogram. The general average of Nos. 1 to 12, inclusive (excepting Nos. 8 and 9), shows a slight progressive loss of weight in the preservative and after periods. The graphic chart, therefore, indicates a tendency on the part of the preservative, whether administered fresh or used after standing in contact with the milk for forty-eight hours, to produce a slight loss of weight in the preservative period, and this influence continues during the after period.

RATIO OF FOOD WEIGHT TO BODY WEIGHT.

In Table III are given the weight of the body, the actual weight of moist and dry food consumed, and the latter items expressed as percentage of body weight. Confining the discussion to the dry food, it is seen in the case of No. 1 that the ratio for each period is 0.92 per cent, and the absolute quantity of dry food administered during these periods is also practically constant, namely, 523, 525, and 522 grams daily.

The data for No. 2 show also an almost constant ratio (0.90) and but slight variation in the dry food consumed (610, 618, and 609 grams daily for the three periods, respectively).

No. 3 shows also an almost constant ratio of 0.92, with scarcely any variation in the quantity of dry food consumed (from 636 to 639 grams daily).

In the case of No. 4 the ratio is again practically constant (about 0.89). The quantity of dry food administered increases 10 grams per day in the preservative period, and there is practically no further change in the after period.

In the case of No. 5 the ratio is larger than in any of the preceding cases, amounting to 1.08 in the fore and preservative periods, and 1.05 in the after period. The quantity of dry food is slightly less in the after period than in the preservative period (12 grams daily), but there is no important variation.

The data for No. 6 show an almost constant ratio (1.02) and that the weight of the food was practically the same in the fore and preservative periods, but increased 10 grams daily in the after period.

In the case of No. 7 the ratio is practically unchanged throughout, averaging 0.94. The quantity of dry food administered is almost identical in all the periods and amounts to 608 grams daily in the preservative period.

In the case of No. 8 the largest ratio indicated in the series is given, namely, 1.29, but the data for the after period are lacking, as the subject was so ill that he left the table at the beginning of the third preservative subperiod. The quantity of dry food administered varies little between the two periods (708 and 714 grams daily, respectively).

In the case of No. 10 the ratio diminishes slightly in the preservative period and was increased in the after period, the figures being 0.95, 0.92, and 0.99 for the three periods, respectively. The weight of dry food diminished 26 grams daily in the preservative period and is increased in the after period to an amount exceeding by 9 grams that of the fore period, amounting to 608 grams. These variations are not of a magnitude to be of great importance.

The ratio in the case in No. 11 is practically constant for the three periods (1.12), and the quantity of dry food administered is also quite constant, increasing 9 grams in the preservative period and amounting to 641 grams.

In the case of No. 12 the ratio is practically constant for the three periods (0.98), and the quantity of dry food administered varies only 6 grams, amounting to 659 grams in the preservative period.

Summaries are given for Nos. 1 to 6, who received formaldehyde directly after it was added to the milk, and for Nos. 7, 10, 11, and 12, who took milk that had been preserved for two days; a general

summary is also given. It will be noticed in the summary of Nos. 1 to 6 that the ratio is 0.95 during the preservative period and 0.94 in the fore and after periods. In the case of Nos. 7, 10, 11, and 12 the ratio in the fore and preservative periods is 0.99 and in the after period 1.00. The general summary shows that there is no difference in the ratios for the fore and preservative periods (0.96), and the increase of 0.01 per cent in the after period is negligible. It is evident from these data that there has been no measurable effect produced upon the ratio of the weight of the body to the weight of the food consumed by reason of the administration of the preservative.

TABLE III.—*Amount of moist and dry food consumed, expressed as percentage of body weight, Series IX.*

[Averages are per day.]

Period.	No. 1.					No. 2.				
	Body weight.	Weight of food.		Average daily ratio of food weight to body weight.		Body weight.	Weight of food.		Average daily ratio of food weight to body weight.	
		Moist.	Dry.	Moist.	Dry.		Moist.	Dry.	Moist.	Dry.
Fore period.										
First subperiod:	*Kilos.*	*Grams.*	*Grams.*	*P. ct.*	*P. ct.*	*Kilos.*	*Grams.*	*Grams.*	*P. ct.*	*P. ct.*
Total	283.94	12,099	2,595	4.26	0.91	344.51	14,621	2,992	4.24	0.87
Average	56.79	2,420	519			68.90	2,924	598		
Second subperiod:										
Total	283.55	12,218	2,634	4.31	.93	344.39	15,086	3,105	4.38	.90
Average	56.71	2,444	527			68.88	3,017	621		
Entire fore period:										
Total	567.49	24,317	5,229	4.29	.92	688.90	29,707	6,097	4.31	.89
Average	56.75	2,432	523			68.89	2,971	610		
Preservative period.										
First subperiod:										
Total	284.04	12,519	2,690	4.41	.95	343.18	15,846	3,184	4.62	.93
Average	56.81	2,504	538			68.64	3,169	637		
Second subperiod:										
Total	283.78	12,535	2,555	4.42	.90	342.54	16 855	2,960	4.92	.87
Average	56.75	2,507	511			68.51	3,371	598		
Third subperiod:										
Total	284.31	14,661	2,636	5.16	.93	340.76	15,353	3,100	4.51	.91
Average	56.86	2,932	527			68.15	3,071	620		
Entire preservative period:										
Total	852.13	39,715	7,881	4.66	.92	1,026.48	48,054	9,274	4.68	.90
Average	56.81	2,648	525			68.43	3,204	618		
After period.										
First subperiod:										
Total	285.10	13,500	2,630	4.74	.92	340.67	16,565	3,055	4.86	.90
Average	57.02	2,700	526			68.13	3,313	611		
Second subperiod:										
Total	284.67	12,531	2,585	4.40	.91	338.43	16,127	3,038	4.77	.90
Average	56.93	2 506	517			67 68	3,225	608		
Entire after period:										
Total	569.77	26,031	5,215	4.57	.92	679.10	32,692	6,093	4.81	90
Average	56.98	2,603	522			67.91	3,269	609		

TABLE III.—*Amount of moist and dry food consumed, expressed as percentage of body weight, Series IX*—Continued.

[Averages are per day.]

Period.	No. 3.					No. 4.				
	Body weight.	Weight of food.		Average daily ratio of food weight to body weight.		Body weight.	Weight of food.		Average daily ratio of food weight to body weight.	
		Moist.	Dry.	Moist.	Dry.		Moist.	Dry.	Moist.	Dry.
Fore period.										
First subperiod:	*Kilos.*	*Grams.*	*Grams.*	*P. ct.*	*P. ct.*	*Kilos.*	*Grams.*	*Grams.*	*P. ct.*	*P. ct.*
Total	351.82	13,434	3,164	3.82	0.90	356.56	12,908	3,062	3.62	0.86
Average	70.36	2,687	633	.....	.....	71.31	2,582	612	.....	.....
Second subperiod:										
Total	349.56	13,432	3,198	3.84	.91	355.49	13,613	3,190	3.83	.90
Average	69.91	2,686	640	.....	.....	71.10	2,723	638	.....	.....
Entire fore period:										
Total	701.38	26,866	6,362	3.83	.91	712.05	26,521	6,252	3.72	.88
Average	70.14	2,687	636	.....	.....	71.21	2,652	625	.....	.....
Preservative period.										
First subperiod:										
Total	347.79	13,341	3,242	3.84	.93	355.52	13,684	3,226	3.85	.91
Average	69.56	2,668	648	.....	.....	71.10	2,737	645	.....	.....
Second subperiod:										
Total	348.21	13,725	3,091	3.94	.89	356.45	13,245	3,071	3.72	.86
Average	69.64	2,745	618	.....	.....	71.29	2,649	614	.....	.....
Third subperiod:										
Total	347.58	13,500	3,256	3.88	.94	355.96	13,761	3,227	3.87	.91
Average	69.51	2,700	651	.....	.....	71.19	2,752	645	.....	.....
Entire preservative period:										
Total	1,043.58	40,566	9,589	3.89	.92	1,067.93	40,690	9,524	3.81	.89
Average	69.57	2,704	639	.....	.....	71.19	2,713	635	.....	.....
After period.										
First subperiod:										
Total	346.64	14,030	3,192	4.05	.92	355.53	12,813	3,166	3.60	.89
Average	69.33	2,806	638	.....	.....	71.10	2,563	633	.....	.....
Second subperiod:										
Total	348.11	13,668	3,167	3.93	.91	355.22	13,328	3,139	3.75	.88
Average	69.62	2,734	633	.....	.....	71.04	2,666	628	.....	.....
Entire after period:										
Total	694.75	27,698	6,359	3.99	.92	710.75	26,141	6,305	3.68	.89
Average	69.48	2,770	636	.....	.....	71.08	2,614	631	.....	.....

TABLE III.—*Amount of moist and dry food consumed, expressed as percentage of body weight, Series IX*—Continued.

[Averages are per day.]

Period.	No. 5.					No. 6.				
	Body weight.	Weight of food.		Average daily ratio of food weight to body weight.		Body weight.	Weight of food.		Average daily ratio of food weight to body weight.	
		Moist.	Dry.	Moist.	Dry.		Moist.	Dry.	Moist.	Dry.
Fore period.										
First subperiod:	*Kilos.*	*Grams.*	*Grams.*	*P. ct.*	*P. ct.*	*Kilos.*	*Grams.*	*Grams.*	*P. ct.*	*P. ct.*
Total	271.75	12,874	2,931	4.74	1.08	297.92	11,614	3,019	3.90	1.01
Average	54.35	2,575	586			59.58	2,323	604		
Second subperiod:										
Total	272.65	12,220	2,928	4.48	1.07	297.69	12,314	2,977	4.14	1.00
Average	54.53	2,444	586			59.54	2,463	595		
Entire fore period:										
Total	544.40	25,094	5,859	4.61	1.08	595.61	23,928	5,996	4.02	1.01
Average	54.44	2,509	586			59.56	2,393	600		
Preservative period.										
First subperiod:										
Total	272.20	12,794	2,984	4.70	1.10	294.60	12,975	3,040	4.40	1.03
Average	54.44	2,559	597			58.92	2,595	608		
Second subperiod:										
Total	273.77	12,825	2,873	4.69	1.05	295.14	11,840	2,924	4.01	.99
Average	54.75	2,565	575			59.03	2,368	585		
Third subperiod:										
Total	273.30	12,570	2,980	4.60	1.09	294.98	12,224	3,049	4.14	1.03
Average	54.66	2,514	596			58.99	2,445	610		
Entire preservative period:										
Total	819.27	38,189	8,837	4.66	1.08	884.72	37,039	9,013	4.19	1.02
Average	54.62	2,546	589			58.98	2,469	601		
After period.										
First subperiod:										
Total	273.96	12,383	2,928	4.52	1.07	296.97	12,510	3,097	4.21	1.04
Average	54.79	2,477	586			59.39	2,502	619		
Second subperiod:										
Total	273.31	12,752	2,842	4.67	1.04	297.49	11,558	3,010	3.89	1.01
Average	54.66	2,550	568			59.49	2,312	602		
Entire after period.										
Total	547.27	25,137	5,770	4.59	1.05	594.46	24,068	6,107	4.05	1.03
Average	54.73	2,514	577			59.45	2,407	611		

TABLE III.—*Amount of moist and dry food consumed, expressed as percentage of body weight, Series IX*—Continued.

[Averages are per day.]

Period.	No. 7.					No. 8.				
	Body weight.	Weight of food.		Average daily ratio of food weight to body weight.		Body weight.	Weight of food.		Average daily ratio of food weight to body weight.	
		Moist.	Dry.	Moist.	Dry.		Moist.	Dry.	Moist.	Dry.
Fore period.										
First subperiod:	*Kilos.*	*Grams.*	*Grams.*	*P. ct.*	*P. ct.*	*Kilos.*	*Grams.*	*Grams.*	*P. ct.*	*P. ct.*
Total	323.85	9,709	3,013	3.00	0.93	272.44	13,869	3,523	5.09	1.29
Average	64.77	1,942	603	.....	.....	54.49	2,774	705	.....	.....
Second subperiod:										
Total	325.79	12,739	3,041	3.91	.93	274.59	14,087	3,553	5.13	1.29
Average	65.16	2,548	608	.....	.....	54.92	2,817	711	.....	.....
Entire fore period:										
Total	649.64	22,448	6,054	3.46	.93	547.03	27,956	7,076	5.11	1.29
Average	64.96	2,245	605	.....	.....	54.70	2,796	708	.....	.....
Preservative period.										
First subperiod:										
Total	324.98	12,838	3,127	3.95	.96	278.66	14,214	3,606	5.10	1.29
Average	64.99	2,568	625	.....	.....	55.73	2,843	721	.....	.....
Second subperiod:										
Total	325.31	12,495	2,949	3.84	.91	279.50	13,945	3,534	4.99	1.26
Average	65.06	2,499	590	.....	.....	55.90	2,789	707	.....	.....
Third subperiod:										
Total	321.56	12,614	3,047	3.92	.95	.....	.....	.....	.....	.....
Average	64.31	2,523	609	.....	.....	.....	.....	.....	.....	.....
Entire preservative period:										
Total	971.85	37,947	9,123	3.90	.94	558.16	28,159	7,140	5.04	1.28
Average	64.79	2,530	608	.....	.....	55.82	2,816	714	.....	.....
After period.										
First subperiod:										
Total	319.40	12,817	3,036	4.01	.95	.....	.....	.....	.....	.....
Average	63.88	2,563	607	.....	.....	.....	.....	.....	.....	.....
Second subperiod:										
Total	317.01	12,701	2,983	4.01	.94	.....	.....	.....	.....	.....
Average	63.40	2,540	597	.....	.....	.....	.....	.....	.....	.....
Entire after period:										
Total	636.41	25,518	6,019	4.01	.95	.....	.....	.....	.....	.....
Average	63.64	2,552	602	.....	.....	.....	.....	.....	.....	.....

TABLE III.—*Amount of moist and dry food consumed, expressed as percentage of body weight, Series IX*—Continued.

[Averages are per day.]

Period.	No. 10.					No. 11.				
	Body weight.	Weight of food.		Average daily ratio of food weight to body weight.		Body weight.	Weight of food.		Average daily ratio of food weight to body weight.	
		Moist.	Dry.	Moist.	Dry.		Moist.	Dry.	Moist.	Dry.
Fore period.										
First subperiod:	*Kilos.*	*Grams.*	*Grams.*	*P. ct.*	*P. ct.*	*Kilos.*	*Grams.*	*Grams.*	*P. ct.*	*P. ct.*
Total	315.87	13,622	2,946	4.31	0.93	280.95	14,343	3,107	5.11	1.11
Average	63.17	2,724	589			56.19	2,869	621		
Second subperiod:										
Total	313.49	14,053	3,041	4.48	.97	283.38	14,294	3,213	5.04	1.13
Average	62.69	2,811	608			56.67	2,859	643		
Entire fore period.										
Total	629.36	27,675	5,987	4.40	.95	564.33	28,637	6,320	5.07	1.12
Average	62.94	2,768	599			56.43	2,864	632		
Preservative period.										
First subperiod:										
Total	313.98	13,785	3,129	4.39	.99	284.88	14,056	3,294	4.93	1.16
Average	62.79	2,757	626			56.97	2,811	659		
Second subperiod:										
Total	312.06	13,695	2,964	4.39	.95	286.50	14,170	3,110	4.95	1.09
Average	62.41	2,739	593			57.30	2,834	622		
Third subperiod:										
Total	310.50	11,664	2,509	3.76	.81	286.96	13,895	3,213	4.84	1.12
Average	62.10	2,333	502			57.39	2,779	643		
Entire preservative period:										
Total	936.54	39,144	8,602	4.18	.92	858.34	42,121	9,617	4.91	1.12
Average	62.44	2,610	573			57.22	2,808	641		
After period.										
First subperiod:										
Total	309.11	13,515	3,053	4.37	.99	288.70	14,085	3,176	4.88	1.10
Average	61.82	2,703	611			57.74	2,817	635		
Second subperiod:										
Total	307.08	13,317	3,027	4.34	.99	289.36	14,255	3,165	4.93	1.09
Average	61.41	2,663	605			57.87	2,851	633		
Entire after period:										
Total	616.19	26,832	6,080	4.35	.99	578.06	28,340	6,341	4.90	1.10
Average	61.62	2,683	608			57.81	2,834	634		

TABLE III.—*Amount of moist and dry food consumed, expressed as percentage of body weight, Series IX*—Continued.

[Averages are per day.]

Period.	No. 12.				
	Body weight.	Weight of food.		Average daily ratio of food weight to body weight.	
		Moist.	Dry.	Moist.	Dry.
Fore period.					
First subperiod:	*Kilos.*	*Grams.*	*Grams.*	*Per cent.*	*Per cent.*
Total	339.15	13,872	3,314	4.09	0.98
Average	67.83	2,774	663		
Second subperiod:					
Total	337.81	14,243	3,316	4.22	.98
Average	67.56	2,849	663		
Entire fore period:					
Total	676.96	28,115	6,630	4.15	.98
Average	67.70	2,812	663		
Preservative period.					
First subperiod.					
Total	338.07	14,769	3,365	4.37	1.00
Average	67.61	2,954	673		
Second subperiod:					
Total	335.96	14,395	3,209	4.28	.96
Average	67.19	2,879	642		
Third subperiod:					
Total	335.08	13,926	3,312	4.12	.99
Average	67.01	2,785	662		
Entire preservative period:					
Total	1,009.11	43,090	9,886	4.27	.98
Average	67.27	2,873	659		
After period.					
First subperiod:					
Total	333.77	14,995	3,286	4.49	.98
Average	66.75	2,999	657		
Second subperiod:					
Total	332.78	15,280	3,284	4.59	.99
Average	66.55	3,056	657		
Entire after period:					
Total	666.55	30,275	6,570	4.54	.99
Average	66.66	3,028	657		

TABLE III.—*Amount of moist and dry food consumed, expressed as percentage of body weight, Series IX*—Continued.

SUMMARIES.

[Averages are per man per day.]

Period.	Nos 1 to 6.					Nos. 7, 10, 11, and 12.				
	Body weight.	Weight of food.		Average daily ratio of food weight to body weight.		Body weight.	Weight of food.		Average daily ratio of food weight to body weight.	
		Moist.	Dry.	Moist.	Dry.		Moist.	Dry.	Moist.	Dry.
Fore period.										
First subperiod:	*Kilos.*	*Grams.*	*Grams.*	*P. ct.*	*P. ct.*	*Kilos.*	*Grams.*	*Grams.*	*P. ct.*	*P. ct.*
Total	1,906.50	77,550	17,763			1,259.82	51,546	12,380		
Average	63.55	2,585	592	4.07	0.93	62.99	2,577	619	4.09	0.98
Second subperiod:										
Total	1,903.33	78,883	18,032			1,260.47	55,329	12,611		
Average	63.44	2,629	601	4.14	.95	63.02	2,766	631	4.39	1.00
Entire fore period:										
Total	3,809.83	156,433	35,795			2,520.29	106,875	24,991		
Average	63.50	2,607	597	4.11	.94	63.01	2,672	625	4.24	.99
Preservative period.										
First subperiod:										
Total	1,897.33	81,159	18,366			1,261.91	55,448	12,915		
Average	63.24	2,705	612	4.28	.97	63.10	2,772	646	4.39	1.02
Second subperiod:										
Total	1,899.89	81,025	17,504			1,259.83	54,755	12,232		
Average	63.33	2,701	583	4.26	.92	62.99	2,738	612	4.35	.97
Third subperiod:										
Total	1,896.89	82,069	18,248			1,254.10	52,099	12,081		
Average	63.23	2,736	608	4.33	.96	62.70	2,605	604	4.15	.96
Entire preservative period:										
Total	5,694.11	244,253	54,118			3,775.84	162,302	37,228		
Average	63.27	2,714	601	4.29	.95	62.93	2,705	620	4.30	.99
After period.										
First subperiod:										
Total	1,898.87	81,801	18,068			1,250.98	55,412	12,551		
Average	63.30	2,727	602	4.31	.95	62.55	2,771	628	4.43	1.00
Second subperiod:										
Total	1,897.23	79,964	17,781			1,246.23	55,553	12,459		
Average	63.24	2,665	593	4.21	.94	62.31	2,778	623	4.46	1.00
Entire after period:										
Total	3,796.10	161,765	35,849			2,497.21	110,965	25,010		
Average	63.27	2,696	597	4.26	.94	62.43	2,774	625	4.44	1.00

TABLE III.—*Amount of moist and dry food consumed, expressed as percentage of body weight, Series IX*—Continued.

SUMMARIES—Continued.

[Averages are per man per day.]

Period.	Nos. 1, 2 3, 4, 5, 6, 7, 10, 11, and 12.				
	Body weight.	Weight of food.		Average daily ratio of food weight to body weight.	
		Moist.	Dry.	Moist.	Dry.
Fore period.					
First subperiod:	*Kilos.*	*Grams.*	*Grams.*	*Per cent.*	*Per cent.*
Total	3,166.32	129,096	30,143		
Average	63.33	2,582	603	4.08	0.95
Second subperiod:					
Total	3,163.80	134,212	30,643		
Average	63.28	2,684	613	4.24	.97
Entire fore period:					
Total	6,330.12	263,308	60,786		
Average	63.30	2,633	608	4.16	.96
Preservative period.					
First subperiod:					
Total	3,159.24	136,607	31,281		
Average	63.18	2,732	626	4.32	.99
Second subperiod:					
Total	3,159.72	135,780	29,736		
Average	63.19	2,716	595	4.30	.94
Third subperiod:					
Total	3,150.99	134,168	30,329		
Average	63.02	2,683	607	4.26	.96
Entire preservative period:					
Total	9,469.95	406,555	91,346		
Average	63.13	2,710	609	4.29	.96
After period.					
First subperiod:					
Total	3,149.85	137,213	30,619		
Average	63.00	2,744	612	4.36	.97
Second subperiod:					
Total	3,143.46	135,517	30,240		
Average	62.87	2,710	605	4.31	.96
Entire after period:					
Total	6,293.31	272,730	60,859		
Average	62.93	2,727	609	4.33	.97

WEIGHT AND WATER CONTENT OF THE FECES.

INDIVIDUAL DATA.

In Table IV are found the data relating to the weight and water content of the feces for Series IX. The weight of moist feces diminishes 3 grams daily in the preservative period in the case of No. 1 and in the after period it is increased 15 grams, exceeding the amount in the fore period. The percentage of water is very slightly decreased in the preservative period and remains practically the same in the after period. The weight of the dry feces is the same in the fore and preservative periods, but is increased 3 grams in the after period. In this case the decrease in the preservative period is due solely to the moisture, but in the after period the increase is due to dry material.

In the case of No. 2 there is a slight diminution in the weight of the moist feces in the preservative period and a marked loss in the after period, the figures being 99, 93, and 73 grams daily for the three periods, respectively. This is chiefly due to the decrease in the content of moisture, which diminished about 2 per cent both in the fore and after periods. The quantity of dry feces is very slightly increased in the preservative period and is notably less in the after period, namely, 4 grams daily. The data for the after period for No. 2 show an opposite tendency as compared with those for No. 1.

The figures for No. 3 show that the quantity of moist feces is notably increased both in the preservative and after period, and this is due to the increase in the percentage of moisture, as the amount of dry feces is slightly less in the preservative period (1 gram) but is notably increased in the after period (4 grams).

No. 4 shows a very large increase in the amount of moist feces in the preservative period (42 grams), and this increase is practically maintained in the after period. The quantity of moisture is markedly greater in the preservative period (5.5 per cent), and decreases in the after period to a figure midway between the figures for the fore and preservative periods. The weight of dry matter increases by 3 grams daily in both the preservative and after periods.

In the case of No. 5 the data show a decrease in the moist feces in the preservative period of 22 grams daily, and another decrease of 12 grams in the after period. This decrease in weight is attended by a decrease in the percentage of moisture in the feces of about 4 and 1.4 per cent for the two periods, respectively. There is only a decrease of 1 gram daily in the weight of the dry feces in the preservative period, but a further loss in the after period of 2 grams daily. It is seen, therefore, that the decrease in moisture is the most marked effect.

In the case of No. 6, the moist feces are considerably increased in weight during the preservative period (17 grams daily) and diminished in the after period by 39 grams. There is a correspondingly large increase in the percentage of moisture in the feces in the preservative period, namely, 6 per cent, and a decrease of about 4 per cent in the after period. The dry matter in the feces is diminished notably in the preservative period (5 grams daily), and in the after period an additional loss of 2 grams takes place. The increase, therefore, is seen to be due entirely to the increase in moisture.

In the case of No. 7 there is a diminution in the weight of the moist feces which is very marked both in the preservative and after periods, amounting to 16 and 13 grams, respectively. There is a slight increase of water in the feces during those two periods (about 2 per cent in the preservative period), and a notable decrease of dry matter, amounting to 6 and 3 grams daily, for the preservative and after

periods, respectively. In this case, the decreased excretion is due solely to the decrease in solids.

The data for No. 8 afford only a partial comparison by reason of the omission of the third preservative subperiod and the whole of the after period. There is an increase in the moist feces in the preservative period, amounting to 10 grams daily, while the weight of dry feces remains unchanged. As would be expected the percentage of water is increased about 1 per cent.

The data for No. 10 show a decrease in the moist feces in the preservative period, amounting to 9 grams daily, and a marked increase in the after period of 19 grams. The percentage of moisture in the feces does not vary greatly for the three periods, decreasing slightly in the preservative period and increasing about 1 per cent, as compared with the fore period, in the after period. The dry feces are 2 grams less daily in the preservative period and slightly greater (1 gram) in the after period than in the fore period. In this case the decreased excretion is due both to the moisture and the solids, and the increase in the after period is also to be attributed to both sources.

In the case of No. 11 there is noted a marked loss in the weight of moist feces in the preservative period, amounting to 32 grams daily, attended by a decrease in the percentage of moisture of about 5 per cent. The solids or dry matter in the feces also decreased 2 grams per day. These conditions are partially overcome in the after period, the moist feces and percentage of moisture increasing but not regaining the figures of the fore period. There is, however, a larger excretion of dry feces in the after period than in the fore period.

In the case of No. 12 there is a marked loss in the weight of the moist feces (24 grams) and also in the percentage of moisture (2 per cent) in the preservative period, and this decrease is even more striking in the after period, a loss of 43 grams in moist feces being recorded. There is little difference in the weight of dry feces in the fore and preservative periods, but in the after period a loss of 7 grams daily is shown, indicating in this case that the decrease is due both to the moisture and the solids.

SUMMARIES.

In the summary for Nos. 1 to 6, inclusive, who received formaldehyde added to milk immediately before it was drunk, results show a slight increase in the weight of the moist feces (7 grams daily), and an increase of about 2 per cent in the percentage of water in the preservative period. There is a slight decrease in the weight of dry feces, amounting to 1 gram per day. The data for the after period are almost the same as those for the fore period. In this case it is seen that the increased excretion is due entirely to increase in moisture

and that the conditions of the fore period are reestablished in the after period.

In the summary for Nos. 7, 10, 11, and 12, who took milk that had been preserved for two days with formaldehyde, the quantity of moist feces is notably diminished during the preservative period (20 grams per day) and the moisture therein decreases 1.56 per cent. This diminution in quantity is continued in the after period to a modified degree (5 grams per day), while there is but little change in the percentage of moisture between the after and the preservative periods. The quantity of dry feces is notably decreased both in the preservative and in the after period, the total average decrease amounting to 4 grams per day. In this case, both solids and moisture content are decreased in the preservative period and the effect is continued in the after period.

A comparison of these two summaries would seem to indicate that the formaldehyde when administered immediately after adding to milk has a less disturbing effect upon the quantity and water content of the feces than that which has stood for forty-eight hours. In the latter case there seems to be a marked tendency to decrease the quantity of both the moist and dry feces excreted, which effect is continued in the after period.

The average data for all the members of the table as given in the third summary show a slight decrease in the quantity of moist feces in the preservative period of 4 grams daily, and a further decrease of 5 grams in the after period. The moisture in the feces shows less than 1 per cent of change during the three periods, being slightly increased in the preservative period. There is a general tendency to decrease the quantity of dry feces excreted, a diminution of 2 grams per day taking place in the preservative period, while the figures for the after and preservative periods are the same. The general conclusion, therefore, to be drawn is that there is a slightly disturbing effect upon the character of the feces produced by the formaldehyde, and that this effect is more marked when the formaldehyde is mixed with milk for a period of forty-eight hours before its administration. The results, however, are not of a character to warrant any important conclusion as to the relation between this slight disturbance of the weight and water content of the feces and the administration of the preservative.

TABLE IV.—*Weight and water content of feces by periods, Series IX.*

[Averages are per day.]

Period.	No. 1.			No. 2.			No. 3.		
	Feces.	Water.	Dry feces.	Feces.	Water.	Dry feces.	Feces.	Water.	Dry feces.
Fore period.									
First subperiod:	*Grams.*	*Per ct.*	*Grams.*	*Grams.*	*Per ct.*	*Grams.*	*Grams.*	*Per ct.*	*Grams.*
Total	a 271	73.80	a 71	584	77.23	133	628	78.98	132
Average	54	.....	14	117	.....	27	126	.....	26
Second subperiod:									
Total	550	81.45	102	409	70.42	121	469	76.76	109
Average	110	.....	20	82	.....	24	94	.....	22
Entire fore period:									
Total	821	78.93	173	993	74.42	254	1,097	78.03	241
Average	82	.....	17	99	.....	25	110	.....	24
Preservative period.									
First subperiod:									
Total	412	78.40	89	401	67.83	129	592	80.07	118
Average	82	.....	18	80	.....	26	118	.....	24
Second subperiod:									
Total	367	77.39	83	397	72.29	110	439	80.64	85
Average	73	.....	17	79	.....	22	88	.....	17
Third subperiod:									
Total	400	79.00	84	597	75.71	145	797	82.18	142
Average	80	.....	17	119	.....	29	159	.....	28
Fourth subperiod:									
Total	495	80.20	98	415	71.81	117	.....	.....	.....
Average	99	.....	20	83	.....	23	.....	.....	.....
Entire preservative period:									
Total	1,179	78.29	256	1,395	72.47	384	1,828	81.13	345
Average	79	.....	17	93	.....	26	122	.....	23
After period.									
First subperiod:									
Total	495	80.20	98	415	71.81	117	468	77.78	104
Average	99	.....	20	83	.....	23	94	.....	21
Second subperiod:									
Total	441	75.96	106	314	67.20	103	1,011	83.18	170
Average	88	.....	21	63	.....	21	202	.....	34
Entire after period:									
Total	936	78.21	204	729	69.82	220	1,479	81.47	274
Average	94	.....	20	73	.....	22	148	.....	27

a These figures are given in round numbers only.

TABLE IV.—*Weight and water content of feces by periods, Series IX*—Continued.

[Averages are per day.]

Period.	No. 4.			No. 5.			No. 6.		
	Feces.	Water.	Dry feces.	Feces.	Water.	Dry feces.	Feces.	Water.	Dry feces.
Fore period.									
First subperiod:	*Grams.*	*Per ct.*	*Grams.*	*Grams.*	*Per ct.*	*Grams.*	*Grams.*	*Per ct.*	*Grams.*
Total	410	73.90	107	634	82.49	111	537	75.79	130
Average	82	.....	21	127	.....	22	107	.....	26
Second subperiod:									
Total	552	77.17	126	336	75.89	81	704	77.98	155
Average	110	.....	25	67	.....	16	141	.....	31
Entire fore period:									
Total	962	75.78	233	970	80.21	192	1,241	77.03	285
Average	96	.....	23	97	.....	19	124	.....	29
Preservative period.									
First subperiod:									
Total	688	82.12	123	430	79.07	90	780	84.87	118
Average	138	.....	25	86	.....	18	156	.....	24
Second subperiod:									
Total	642	81.31	120	332	74.10	86	819	83.64	134
Average	128	.....	24	66	.....	17	164	.....	27
Third subperiod:									
Total	744	80.38	146	368	74.73	93	518	80.12	103
Average	149	.....	29	74	.....	19	104	.....	21
Entire preservative period:									
Total	2,074	81.24	389	1,130	76.19	269	2,117	83.23	355
Average	138	.....	26	75	.....	18	141	.....	24
After period.									
First subperiod:									
Total	647	78.05	142	341	76.83	79	525	80.38	103
Average	129	.....	28	68	.....	16	105	.....	21
Second subperiod:									
Total	725	79.17	151	285	72.28	79	497	77.46	112
Average	145	.....	30	57	.....	16	99	.....	22
Entire after period:									
Total	1,372	78.64	293	626	74.76	158	1,022	78.96	215
Average	137	.....	29	63	.....	16	102	.....	22

TABLE IV.—*Weight and water content of feces by periods, Series IX*—Continued.

[Averages are per day.]

Period.	No. 7.			No. 8.			No. 10.		
	Feces.	Water.	Dry feces.	Feces.	Water.	Dry feces.	Feces.	Water.	Dry feces.
Fore period.									
First subperiod:	*Grams.*	*Per ct.*	*Grams.*	*Grams.*	*Per ct.*	*Grams.*	*Grams.*	*Per ct.*	*Grams.*
Total	(448)	(70.98)	(130)	763	80.73	147	404	75.99	97
Average	90	.....	26	153	.....	29	81	.....	19
Second subperiod:									
Total	448	70.98	130	798	81.33	149	521	75.05	130
Average	90	.....	26	160	.....	30	104	.....	26
Entire fore period:									
Total	896	70.98	260	1,561	81.04	296	925	75.46	227
Average	90	.....	26	156	.....	30	93	.....	23
Preservative period.									
First subperiod:									
Total	393	73.79	103	836	82.30	148	514	75.49	126
Average	79	.....	21	167	.....	30	103	.....	25
Second subperiod:									
Total	329	71.73	93	821	81.97	148	397	75.31	98
Average	66	.....	19	164	.....	30	79	.....	20
Third subperiod:									
Total	391	73.15	105	.....	.....	.....	345	73.04	93
Average	78	.....	21	.....	.....	.....	69	.....	19
Entire preservative period:									
Total	1,113	72.96	301	1,657	82.14	296	1,256	74.76	317
Average	74	.....	20	166	.....	30	84	.....	21
After period.									
First subperiod:									
Total	132	71.97	37	.....	.....	.....	507	76.13	121
Average	26	.....	7	.....	.....	.....	101	.....	24
Second subperiod:									
Total	479	72.23	133	.....	.....	.....	520	76.92	120
Average	96	.....	27	.....	.....	.....	104	.....	24
Entire after period:									
Total	611	72.18	170	.....	.....	.....	1,027	76.53	241
Average	61	.....	17	.....	.....	.....	103	.....	24

TABLE IV.—*Weight and water content of feces by periods, Series IX*—Continued.

[Averages are per day.]

Period.	No. 11.			No. 12.		
	Feces.	Water.	Dry feces.	Feces.	Water.	Dry feces.
Fore period.						
First subperiod:	*Grams.*	*Per ct.*	*Grams.*	*Grams.*	*Per ct.*	*Grams.*
Total	578	79.24	120	797	83.06	135
Average	116	.....	24	159	.....	27
Second subperiod:						
Total	566	80.04	113	888	82.88	152
Average	113	.....	23	178	.....	30
Entire fore period:						
Total	1,144	79.63	233	1,685	82.97	287
Average	114	.....	23	169	.....	29
Preservative period.						
First subperiod:						
Total	410	77.07	94	1,036	81.95	187
Average	82	.....	19	207	.....	37
Second subperiod:						
Total	323	70.28	96	644	82.61	112
Average	65	.....	19	129	.....	22
Third subperiod:						
Total	501	76.05	120	493	76.88	114
Average	100	.....	24	99	.....	25
Entire preservative period:						
Total	1,234	74.88	310	2,173	80.99	413
Average	82	.....	21	145	.....	28
After period.						
First subperiod:						
Total	439	73.58	116	566	80.04	113
Average	88	.....	23	113	.....	23
Second subperiod:						
Total	550	78.36	119	456	78.07	100
Average	110	.....	24	91	.....	20
Entire after period:						
Total	989	76.24	235	1,022	79.16	213
Average	99	.....	24	102	.....	21

TABLE IV.—*Weight and water content of feces by periods, Series IX*—Continued.

SUMMARIES.

[Averages are per man per day.]

Period.	Nos. 1 to 6.			Nos. 7 to 12 (omitting Nos. 8 and 9).			Nos. 1 to 12 (omitting Nos. 8 and 9).		
	Feces.	Water.	Dry feces.	Feces.	Water	Dry feces.	Feces.	Water.	Dry feces.
Fore period.	*Grams.*	*Per ct.*	*Grams.*	*Grams.*	*Per ct.*	*Grams.*	*Grams.*	*Per ct.*	*Grams.*
First subperiod:									
Total	3,064	77.68	684	2,227	78.36	482	5,291	77.96	1,166
Average	102	.....	23	111	.....	24	106	.....	23
Second subperiod:									
Total	3,020	77.02	694	2,423	78.33	525	5,443	77.60	1,219
Average	101	.....	23	121	.....	26	109	.....	24
Entire fore period:									
Total	6,084	77.35	1,378	4,650	78.34	1,007	10,734	77.78	2,385
Average	101	.....	23	116	.....	25	107	.....	24
Preservative period.									
First subperiod:									
Total	3,303	79.81	667	2,353	78.33	510	5,656	79.19	1,177
Average	110	.....	22	118	.....	26	113	.....	24
Second subperiod:									
Total	2,996	79.37	618	1,693	76.43	399	4,689	78.31	1,017
Average	100	.....	21	84	.....	20	94	.....	20
Third subperiod:									
Total	3,424	79.18	713	1,730	75.03	432	5,154	77.78	1,145
Average	114	.....	24	86	.....	22	103	.....	23
Entire preservative period:									
Total	9,723	79.45	1,998	5,776	76.78	1,341	15,499	78.46	3,339
Average	108	.....	22	96	.....	22	103	.....	22
After period.									
First subperiod:									
Total	2,891	77.76	643	1,644	76.46	387	4,535	77.29	1,030
Average	96	.....	21	82	.....	19	91	.....	21
Second subperiod:									
Total	3,273	77.97	721	2,005	76.46	472	5,278	77.40	1,193
Average	109	.....	24	100	.....	24	106	.....	24
Entire after period:									
Total	6,164	77.87	1,364	3,649	76.46	859	9,813	77.35	2,223
Average	103	.....	23	91	.....	21	98	.....	22

THE URINE.

VOLUME, SPECIFIC GRAVITY, AND TOTAL SOLIDS.

Table V contains the data relating to the volume of urine excreted, its specific gravity, and the total solids therein.

INDIVIDUAL DATA.

There is a notable increase in the volume of the urine in the case of No. 1 during the preservative period, amounting to 317 cc daily, attended by a decrease in specific gravity of 0.0038. This increase in volume is practically maintained in the after period, and the specific gravity is again decreased. The quantity of solids excreted is larger in the preservative period than in the fore period by 3 grams daily, and in the after period a loss of 2 grams occurs.

In the case of No. 2 there is an increase in the volume of the urine in the preservative period of 276 cc daily, attended by a decrease in specific gravity. This increase in volume is continued in the after period, and the specific gravity is slightly increased. The total solids excreted are the same in the fore and preservative periods and slightly greater in the after period.

In the case of No. 3 the volume of urine excreted is almost the same in the preservative period as in the fore period (an increase of only 9 cc daily), and is very slightly decreased in the after period. The specific gravity is increased slightly in the preservative period and to a greater extent in the after period. The total solids excreted in the urine remain almost the same for the three periods, increasing by 1 gram throughout.

The data for No. 4 show a very slight increase in the volume of urine in the preservative period, amounting to 47 cc daily, and a very slight decrease in specific gravity. In the after period there is a decrease of 70 cc in the volume of urine and a notable increase in the specific gravity. The quantity of total solids voided daily is the same in the fore and after periods and increased only by 2 grams daily in the preservative period.

The data in the case of No. 5 show an increase in the volume of urine in the preservative period (63 cc daily), and this increase is partially maintained in the after period. The specific gravity is the same for the fore and preservative periods, increasing very slightly in the after period. The quantity of solids excreted daily in the urine is increased slightly (3 grams) in the preservative period, and is still further increased by 1 gram in the after period.

No. 6 excretes a smaller quantity of urine in the preservative period than in the fore period and a still smaller quantity in the after period, the difference between the daily average for the fore and after periods being 50 cc. The smallest quantity of urine, however, has the highest specific gravity, the total solids excreted being the same for the fore and preservative periods, and only decreased by 1 gram in the after period.

The data for No. 7 show an increase in the volume of the urine in the preservative period of 69 cc daily, and a further increase of 65 cc in the after period. The specific gravity falls both in the preservative and in the after period, and the quantity of total solids excreted is 4 grams less in the preservative period than in the fore period, and there is another decrease of 1 gram in the after period.

There is also an increase of 62 cc daily in the volume of urine excreted by No. 8 in the preservative period and a slight decrease in the specific gravity thereof, the total solids voided increasing 2 grams. There are no data for No. 8 for the after period, and the figures for the preservative period cover only ten days. (See page —).

The data for No. 10 show a marked decrease in the volume of urine in the preservative period, amounting to 109 cc daily, and for the after period practically the same volume as in the fore period is recorded. The specific gravity of the urine during the preservative and after periods is higher than in the fore period. The quantity of total solids excreted is decreased in the preservative period by 2 grams, and is 2 grams greater in the after period than in the fore period.

No. 11 shows a very slight decrease in the volume of urine in the preservative period (29 cc) and a notable increase in the after period, exceeding the amount of the fore period by 92 cc. The specific gravity is low throughout, being a little higher in the preservative period than in any other. The quantity of solids excreted is increased 4 grams in the preservative period, and an additional increase of 3 grams is shown in the after period.

The data for No. 12 show a notable increase in the volume of urine in the preservative period, amounting to 153 cc daily, and an additional increase of 180 cc during the after period. This increase in the volume is attended by a steadily diminishing specific gravity. The quantity of total solids excreted is increased 4 grams in the preservative period and an additional gram in the after period.

SUMMARIES.

The summary for Nos. 1 to 6, who received formaldehyde as soon as it was mixed with the milk, shows an excretion of urine in the fore period of 970 cc, in the preservative period of 1,085 cc (an increase of 115 cc daily), and in the after period of 1,062 cc. The specific gravity of the urine is slightly decreased when the larger quantities are excreted, the total solids excreted in the urine being only 1 gram greater in the preservative and after periods than in the fore period. The data, therefore, show a tendency during the administration of the preservative to increase the volume of urine excreted, to diminish its specific gravity, and to increase slightly the total quantity of solids excreted.

The summary for Nos. 7, 10, 11, and 12, who received formaldehyde after two days' contact with milk, shows a very slight increase in the volume of urine in the preservative period (only 21 cc daily), and a notable increase in the after period of 118 cc. The specific gravity of the urine in the fore and preservative periods is almost the same, but is somewhat decreased in the after period. The quantity of total solids excreted is increased 1 gram in the preservative period and an additional 2 grams in the after period. These data show a slight tendency on the part of the formaldehyde to increase the volume of the urine and to decrease specific gravity, and also to increase slightly

the quantity of total solids excreted in the preservative and after periods.

The average effect produced, ascertained by combining in one expression the data for all the subjects except Nos. 8 and 9, indicates a slight increase in the volume of urine in the preservative period (77 cc daily), followed by an additional increase in the after period. The specific gravity decreases in almost the same proportion as the volume of the urine increases, the quantity of total solids excreted being 58, 59, and 60 grams daily for the three periods, respectively.

The general effect of the formaldehyde, therefore, may be regarded as slightly diuretic, considerably increasing the volume of the urine, especially in the case of Nos. 1 to 6 during the preservative period, while for Nos. 7, 10, 11, and 12 the greater increase occurs in the after period. Practically no influence is exerted on the total solids excreted.

TABLE V.—*Urine determinations—Volume, specific gravity, and total solids, Series IX.*

[Averages are per day.]

Period.	No. 1			No. 2.			No. 3.		
	Volume	Specific gravity at 25°/25° C.	Total solids (factor 0.245)	Volume	Specific gravity at 25°/25° C.	Total solids (factor 0.245).	Volume.	Specific gravity at 25°/25° C.	Total solids (factor 0.245).
Fore period.									
First subperiod:	*cc.*		*Grams.*	*cc.*		*Grams.*	*cc.*		*Grams.*
Total	5,350	1.0192	252	5,770	1.0218	308	4,640	1.0263	289
Average	1,070	.....	50	1,154	.....	62	928	.....	60
Second subperiod.									
Total	4,560	1.0230	257	6,205	1.0211	321	4,460	1.0267	292
Average	912	.....	51	1,241	.....	64	892	.....	58
Entire fore period:									
Total	9,910	1.0211	509	11,975	1.0214	629	9,100	1.0265	591
Average	991	.....	51	1,198	.....	63	910	.....	59
Preservative period.									
First subperiod:									
Total	5,485	1.0201	270	7,315	1.0173	310	4,660	1.0274	313
Average	1,097	.....	54	1,463	.....	62	932	.....	63
Second subperiod:									
Total	6,230	1.0178	272	8,220	1.0157	316	4,510	1.0265	293
Average	1,246	.....	54	1,644	.....	63	902	.....	59
Third subperiod:									
Total	7,905	1.0139	269	6,570	1.0198	319	4,615	1.0264	298
Average	1,581	.....	54	1,314	.....	64	923	.....	60
Entire preservative period.									
Total	19,620	1.0173	811	22,105	1.0176	945	13,785	1.0268	904
Average	1,308	.....	54	1,474	.....	63	919	.....	60
After period.									
First subperiod:									
Total	7,350	1.0145	261	7,980	1.0164	321	4,440	1.0281	306
Average	1,470	.....	52	1,596	.....	64	888	.....	61
Second subperiod:									
Total	5,680	1.0189	263	6,780	1.0200	332	4,505	1.0279	308
Average	1,136	.....	53	1,356	.....	66	901	.....	62
Entire after period:									
Total	13,030	1.0167	524	14,760	1.0182	653	8,945	1.0280	614
Average	1,303	.....	52	1,476	.....	65	895	.....	61

TABLE V.—*Urine determinations—Volume, specific gravity, and total solids, Series IX—* Continued.

[Averages are per day.]

Period	No. 4.			No. 5.			No. 6.		
	Volume	Specific gravity at 25°/25° C.	Total solids (factor 0.245).	Volume.	Specific gravity at 25°/25° C.	Total solids (factor 0.245).	Volume.	Specific gravity at 25°/25° C.	Total solids (factor 0.245).
Fore period.									
First subperiod:	*cc.*		*Grams.*	*cc.*		*Grams.*	*cc.*		*Grams.*
Total	4,985	1.0228	278	4,355	1.0214	228	4,045	1.0251	249
Average	997	.....	56	871	.....	46	809	.....	50
Second subperiod:									
Total	5,070	1.0246	306	4,635	1.0232	263	4,100	1.0284	285
Average	1,014	.....	61	927	.....	53	820	.....	57
Entire fore period:									
Total	10,055	1.0237	584	8,990	1.0223	491	8,145	1.0268	534
Average	1,006	.....	58	899	.....	49	815	.....	53
Preservative period.									
First subperiod:									
Total	5,260	1.0238	307	4,165	1.0252	257	3,860	1.0281	266
Average	1,052	.....	61	833	.....	51	772	.....	53
Second subperiod:									
Total	5,385	1.0227	300	4,930	1.0219	265	4,040	1.0273	270
Average	1,077	.....	60	986	.....	53	808	.....	54
Third subperiod:									
Total	5,150	1.0238	300	5,330	1.0197	257	4,005	1.0267	262
Average	1,030	.....	60	1,066	.....	51	801	.....	52
Entire preservative period:									
Total	15,795	1.0234	907	14,425	1.0223	779	11,905	1.0274	798
Average	1,053	.....	60	962	.....	52	794	.....	53
After period.									
First subperiod:									
Total	4,805	1.0241	284	4,720	1.0217	251	3,780	1.0274	254
Average	961	.....	57	944	.....	50	756	.....	51
Second subperiod:									
Total	5,020	1.0242	298	4,770	1.0235	275	3,865	1.0276	261
Average	1,004	.....	60	954	.....	55	773	.....	52
Entire after period:									
Total	9,825	1.0292	582	9,490	1.0226	526	7,645	1.0275	515
Average	983	.....	58	949	.....	53	765	.....	52

TABLE V.—*Urine determinations—Volume, specific gravity, and total solids, Series IX*—Continued.

[Averages are per day.]

Period.	No. 7.			No. 8.			No. 10.		
	Volume.	Specific gravity at 25°/25° C.	Total solids (factor 0.245).	Volume.	Specific gravity at 25°/25° C.	Total solids (factor 0.245).	Volume.	Special gravity at 25°/25° C.	Total solids (factor 0.245).
Fore period.									
First subperiod:	*cc.*		*Grams.*	*cc.*		*Grams.*	*cc.*		*Grams.*
Total	4,820	1.0261	308	6,110	1.0217	325	6,660	1.0197	321
Average	964	.....	62	1,222	.....	65	1,332	.....	64
Second subperiod:									
Total	4,820	1.0261	308	5,355	1.0254	333	5,290	1.0256	332
Average	964	.....	62	1,071	.....	67	1,058	.....	66
Entire fore period:									
Total	9,640	1.0261	616	11,465	1.0236	658	11,950	1.0226	653
Average	964	.....	62	1,147	.....	66	1,195	.....	65
Preservative period.									
First subperiod:									
Total	5,380	1.0226	298	6,090	1.0228	340	5,470	1.0247	331
Average	1,076	.....	60	1,218	.....	68	1,094	.....	66
Second subperiod:									
Total	5,200	1.0236	301	5,995	1.0234	344	5,510	1.0240	324
Average	1,040	.....	60	1,199	.....	69	1,102	.....	65
Third subperiod:									
Total	4,920	1.0230	277	.....	.....	.....	5,310	1.0222	289
Average	984	.....	55	.....	.....	.....	1,062	.....	58
Entire preservative period:									
Total	15,500	1.0231	876	12,085	1.0231	684	16,290	1.0236	944
Average	1,033	.....	58	1,209	.....	68	1,086	.....	63
After period.									
First subperiod:									
Total	5,325	1.0203	265	.....	.....	.....	6,060	1.0226	336
Average	1,065	.....	53	.....	.....	.....	1,212	.....	67
Second subperiod:									
Total	5,650	1.0217	300	.....	.....	.....	5,860	1.0233	335
Average	1,130	.....	60	.....	.....	.....	1,172	.....	67
Entire after period:									
Total	10,975	1.0210	565	.....	.....	.....	11,920	1.0230	671
Average	1,098	.....	57	.....	.....	.....	1,192	.....	67

TABLE V.—*Urine determinations—Volume, specific gravity, and total solids, Series IX*—Continued.

[Averages are per day.]

Period	No. 11.			No. 12.		
	Volume.	Specific gravity at 25°/25° C	Total solids (factor 0.245).	Volume.	Specific gravity at 25°/25° C.	Total solids (factor 0.245).
Fore period.						
First subperiod:	*cc.*		*Grams.*	*cc.*		*Grams.*
Total	6,795	1.0159	265	6,410	1.0207	325
Average	1,359	.....	53	1,282	.....	65
Second subperiod:						
Total	6,010	1.0202	297	5,990	1.0204	299
Average	1,202	.....	59	1,198	.....	60
Entire fore period:						
Total	12,805	1.0180	562	12,400	1.0208	624
Average	1,281	.....	56	1,240	.....	62
Preservative period.						
First subperiod:						
Total	6,150	1.0204	307	6,875	1.0208	350
Average	1,230	.....	61	1,375	.....	70
Second subperiod:						
Total	5,990	1.0206	302	6,875	1.0190	320
Average	1,198	.....	60	1,375	.....	64
Third subperiod:						
Total	6,635	1.0180	293	7,140	1.0187	327
Average	1,327	.....	59	1,428	.....	65
Entire preservative period:						
Total	18,775	1.0197	902	20,890	1.0195	997
Average	1,252	.....	60	1,393	.....	66
After period.						
First subperiod:						
Total	6,815	1.0185	309	8,135	1.0167	333
Average	1,363	.....	62	1,627	.....	67
Second subperiod:						
Total	6,910	1.0190	322	7,590	1.0183	340
Average	1,382	.....	64	1,518	.....	68
Entire after period:						
Total	13,725	1.0188	631	15,725	1.0175	673
Average	1,373	.....	63	1,573	.....	67

TABLE V.—*Urine determinations—Volume, specific gravity, and total solids, Series IX*—Continued.

SUMMARIES.

[Averages are per man per day.]

Period.	Nos. 1 to 6.			Nos. 7 10 11, and 12.			Nos. 1 to 12, omitting Nos. 8 and 9.		
	Volume.	Specific gravity at 25°/25° C.	Total solids (factor 0.245).	Volume.	Specific gravity at 25°/25 C.	Total solids (factor 0.245).	Volume.	Specific gravity at 25°/25° C.	Total solids (factor 0.245).
Fore period.									
First subperiod:	*cc.*		*Grams.*	*cc.*		*Grams.*	*cc.*		*Grams.*
Total	29,145	1.0228	1614	24,685	1.0206	1219	53,830	1.0219	2833
Average	972	.....	54	1,234	.....	66	1,077	.....	57
Second subperiod:									
Total	29,030	1.0245	1724	22,110	1.0231	1236	51,140	1.0239	2960
Average	968	.....	57	1,106	.....	62	1,027	.....	59
Entire fore period:									
Total	58,175	1.0236	3338	46,795	1.0218	2455	104,970	1.0229	5793
Average	970	.....	56	1,170	.....	61	1,050	.....	58
Preservative period.									
First subperiod:									
Total	30,745	1.0236	1723	23,875	1.0221	1286	54,620	1.0230	3009
Average	1,025	.....	57	1,194	.....	64	1,924	.....	60
Second subperiod:									
Total	33,315	1.0220	1716	23,575	1.0218	1247	56,890	1.0219	2963
Average	1,110	.....	57	1,179	.....	62	1,138	.....	59
Third subperiod:									
Total	33,575	1.0217	1705	24,005	1.0205	1186	57,580	1.0212	2891
Average	1,119	.....	57	1,200	.....	59	1,156	.....	58
Entire preservative period:									
Total	97,635	1.0224	5144	71,455	1.0215	3719	169,090	1.0220	8863
Average	1,085	.....	57	1,191	.....	62	1,127	.....	59
After period.									
First subperiod:									
Total	33,075	1.0220	1677	26,335	1.0195	1243	59,410	1.0210	2920
Average	1,102	.....	56	1,317	.....	62	1,188	.....	58
Second subperiod:									
Total	30,620	1.0237	1737	26,010	1.0206	1297	56,630	1.0224	3034
Average	1,021	.....	58	1,300	.....	65	1,133	.....	61
Entire after period:									
Total	63,695	1.0228	3414	52,345	1.0200	2540	116,040	1.0217	5954
Average	1,062	.....	57	1,309	.....	64	1,160	.....	60

PRESENCE OF ALBUMIN AND REACTION OF THE URINE.

Only qualitative data were obtained showing the reaction of the urine expressed as the number of times it was acid or amphoteric to litmus paper and the occurrence of albumin in the three periods.

In the case of No. 1 there is one occurrence of an amphoteric reaction during the preservative period, while all of the other observations show an acid reaction. No albumin is found in the urine at any time during the observation.

No. 2, in the first preservative subperiod, shows a decided change in the reaction of the urine, which is amphoteric in four of the five determinations made. At all of the other observations the urine is acid with the exception of one amphoteric reaction in the second fore subperiod. There is a trace of albumin present throughout the

entire observation, but the data do not establish any tendency to increase or decrease the occurrence in the preservative period.

There is evidence in the case of No. 3 of a reduction in the acidity of the urine during the preservative period and a strong tendency to increase the occurrence of albumin.

In the case of No. 4 there is a slight relative increase in the acidity; albumin is found at all nine observations in the preservative and after periods, and occurs at only four out of seven in the fore period.

There is a slight reduction in the acidity of the urine in the case of No. 5 throughout the observation, and albumin is reported in only one instance near the close of the preservative period.

The data for No. 6 do not show any change either for acidity or the occurrence of albumin, the urine remaining acid and showing a trace of albumin throughout the entire period of observation.

In the case of No. 7 the urine is acid throughout, with the exception of one observation in the fore period, while in the case of albumin there is a constant occurrence reported, with the exception of two observations in the fore period.

There is no change shown in the data obtained for No. 8 up to the time he was forced to withdraw from the experiment, the urine being acid throughout, and no albumin present.

No. 10 gives an acid reaction for the urine and shows no tendency toward albuminurea throughout the entire period of observation.

In the case of No. 11 there is practically no change in the acidity of the urine and no occurrence of albumin is reported at any time during the experiment.

The same is true for No. 12 in regard to acidity, though the single amphoteric reaction obtained occurs in the preservative period, and for albumin the only positive test reported occurs in the after period.

From the individual data it is seen that there is a slight tendency manifested in a few cases to decrease the acidity in the urine and to increase the occurrence of albumin, but, taken as a whole, the data do not show any consistent general tendency on the part of the preservative to affect the acidity of the urine, or the presence of albumin therein; though in three cases the occurrence of albumin seems to be increased during the administration of the preservative.

QUANTITY OF UREA AND RATIO OF SULPHUR, SULPHATES, AND PHOSPHATES TO NITROGEN IN THE URINE.

INDIVIDUAL DATA.

It is important to determine whether or not the administration of formaldehyde had any notable influence upon the excretion of urea, and the relation of the sulphur, sulphates, and phosphates in the urine to the nitrogen therein. The data for the determination of these points are given in Table VI.

In the case of No. 1 there is a larger quantity of nitrogen excreted in the preservative period and a smaller quantity in the after period than in the fore period. The percentage of urea nitrogen based on the total nitrogen is larger both in the preservative and after periods than in the fore period. The ratio of sulphur to nitrogen is very slightly diminished and the ratio of phosphoric acid to nitrogen is notably diminished in the preservative period, with a further decrease in the after period. These data indicate an increase in the excretion of sulphur, sulphates, and phosphoric acid both in the preservative and after periods in relation to the nitrogen.

The data for No. 2 show that the percentage of nitrogen occurring as urea in the urine is quite constant throughout the three periods. The quantity of total nitrogen is notably diminished in the preservative period, while the increase in the after period does not bring the number back to the magnitude of the fore period. The total sulphur and sulphur excreted as sulphates are slightly diminished in the preservative period, while the quantity of phosphoric acid is slightly increased both in the preservative and after periods. The ratio of sulphur to nitrogen is diminished in the preservative period, and the same is true of the ratio of sulphates and of phosphoric acid to nitrogen. In this case the quantity of sulphur and sulphates excreted is diminished, but not in proportion to the diminished quantity of the nitrogen in the urine. The increase in the phosphoric acid excreted, together with the decrease in the nitrogen, causes a notable change in the ratio of the phosphoric acid to nitrogen. Again, in this case, there is shown a greater relative increase in the phosphoric acid excreted, while in the excretion of sulphur there is practically the same decrease as of the nitrogen.

There is a slight diminution of the total nitrogen excreted in the urine in the case of No. 3 in the preservative and after periods, and the same is true of the urea nitrogen. The percentage of the urea nitrogen in terms of total nitrogen is decidedly larger in the preservative period. The quantity of urea is slightly less in the preservative period and decidedly decreased in the after period. The quantity of total sulphur as S excreted is less during the preservative period, while very little change is shown in the quantity of sulphur as sulphates excreted in the three periods. There is a slight increase in the quantity of phosphoric acid excreted both in the preservative and after periods. The ratio of the sulphur to the nitrogen is almost the same in the preservative period as in the fore period and is slightly less in the after period, and the ratio of sulphates to nitrogen decreases very slightly throughout. The ratio of phosphoric acid diminishes to some extent in the preservative period and very slightly in the after period, showing an increased excretion of phosphoric acid as compared with nitrogen.

The data for No. 4 show a slight increase in the excretion of both nitrogen and urea nitrogen in the preservative period and a diminution in the after period. The percentage of urea nitrogen is slightly diminished in the preservative and after periods. The total urea excreted is increased in the preservative period and notably diminished in the after period. The amount of sulphur, sulphates, and phosphoric acid excreted is greater in the preservative period than in the fore period. The ratios of sulphur and sulphates to nitrogen are slightly decreased in the preservative and after periods. The ratio of phosphoric acid to nitrogen is also decreased in the preservative and after periods. In this instance there is shown a slight tendency to increase the proportions of sulphur, sulphates, and phosphoric acid in respect of the nitrogen excreted.

The data for No. 5 show a slight decrease both in the nitrogen and the urea nitrogen in the preservative period, and this decrease is almost restored in the after period. The percentage of urea nitrogen diminishes slightly in both the preservative and after periods. The total urea is also less in the preservative period, and this loss is only partly restored in the after period. The quantity of sulphur and sulphates excreted is notably diminished in the preservative period and this loss is only partially restored in the after period. There is an increase in the quantity of phosphoric acid excreted both in the preservative and after periods. In this instance there is quite a decrease of sulphur compounds in relation to the nitrogen excreted, which is contrary to the results obtained for Nos. 1 to 4, while in the case of phosphoric acid the same relative increase is maintained as in the previous subjects.

From the data for No. 6 it is seen that the quantities of nitrogen and urea nitrogen excreted in the preservative period are slightly greater than in the fore period, while in the after period they are slightly less. The percentage of urea nitrogen is low in the fore period and notably increased in the preservative and after periods. The quantity of urea excreted is largest in the preservative period and least in the after period. Less total sulphur and more sulphur as SO_3 are excreted in the preservative period, while the quantities of each in the after period are less than in the fore period. There is again a very notable increase in the quantity of phosphoric acid in the preservative period, and this increase is almost maintained in the after period. The ratio of sulphur to nitrogen is notably increased both in the preservative and after periods as compared with the fore period. The ratio of sulphates to nitrogen is very slightly increased in the preservative period, and is diminished in the after period. The ratio of phosphoric acid is notably decreased both in the preservative and after periods. These data show a decrease in the quantity of sulphur and sulphates, and a marked increase in the quantity of phosphoric

acid excreted in relation to nitrogen under the influence of the preservative.

In the case of No. 7 there is a slight diminution in the excretion both of nitrogen and urea nitrogen in the urine during the preservative period and also during the after period. The percentage of urea nitrogen in terms of total nitrogen does not vary in the fore and preservative periods, but there is an increase in the after period. The quantity of urea excreted is notably diminished both in the preservative and after periods. The quantity of sulphur and sulphates excreted in the preservative period is slightly diminished as compared with the fore period, and there is also a diminution in the quantity of phosphoric acid in the preservative period. The ratios show a notable increase in the quantity of sulphur and sulphates excreted in relation to the nitrogen, and in the case of the phosphoric acid excreted in relation to nitrogen a slight increase is shown, which, however, is not so marked as in most of the previous cases.

The data for No. 8 are not complete. They show a slight relative increase in the quantity of sulphur and sulphates and a notable increase in the quantity of phosphoric acid excreted in relation to the nitrogen in the urine.

The data for No. 10 show a slight decrease in the total nitrogen during the preservative period and a marked increase in the after period. This is also true of the urea nitrogen excreted. The percentage of urea nitrogen is almost the same in the fore and preservative periods and slightly increased in the after period. The total urea excreted is diminished in the preservative period and increased in the after period. The ratios show a very slight decrease in the quantity of sulphur, no change in the quantity of sulphates, and a slight increase in the quantity of phosphoric acid excreted in relation to the nitrogen in the urine.

The data for No. 11 show an increase in the total nitrogen excreted both in the preservative and after periods. The percentage of urea nitrogen, based on the total nitrogen in the urine, is notably diminished in the preservative period, and though partly restored in the after period it does not reach the magnitude of the figure for the fore period. The quantity of urea and of urea nitrogen excreted is almost the same in the fore and the preservative periods and is notably increased in the after period. The absolute quantities of sulphur and sulphates are increased in the preservative period and still further increased in the after period. The absolute quantity of phosphoric acid excreted is increased both in the preservative and after periods. The ratios show a slight increase in the relative quantities of sulphur, sulphates, and phosphoric acid compared with the nitrogen excreted in the preservative period. In so far as sulphur is concerned this relation is reversed in the after period as compared with the fore period, but it is maintained for sulphates and phosphoric acid.

The data for No. 12 show a slight decrease both in the total nitrogen and in the urea nitrogen during the preservative period, followed by an increase in the after period, the decrease being more than restored in the case of the nitrogen. The percentage of urea nitrogen is diminished both in the preservative and after periods. The total urea excreted is less in the preservative period and this loss is almost restored in the after period. The absolute quantities of sulphur and phosphoric acid are increased in the preservative period and further increased in the after period, while the sulphur as sulphates is slightly decreased in the preservative period. The ratios show that the quantities of sulphur, sulphates, and phosphoric acid excreted in relation to the total nitrogen are increased during the preservative period, and this relation is practically maintained in the after period.

SUMMARIES.

Three summaries are given, representing the subjects from Nos. 1 to 6, inclusive, who received the formaldehyde as soon as it was added to the milk; Nos. 7, 10, 11, and 12, who received formaldehyde which had stood in contact with milk for two days, and the complete summary for Nos. 1 to 12, excluding Nos. 8 and 9.

In the first summary, namely for Nos. 1 to 6, inclusive, the data show a slight diminution in the total nitrogen excreted and a slight increase in the total urea nitrogen in the preservative period. There is a marked diminution of both in the after period. The percentage of urea nitrogen is greater both in the preservative and after periods than in the fore period. The total urea excreted is almost the same in the fore and preservative periods and somewhat less in the after period. The total sulphur excreted is very slightly diminished throughout, while the sulphates are almost the same in the fore and preservative periods and slightly less in the after period. The phosphoric acid excreted is notably greater in the preservative period and there is only a very slight diminution as compared with this amount in the after period. The ratio of total sulphur to nitrogen is the same in the fore and preservative periods and slightly less in the after period. In the sulphate ratio there is a very slight decrease in the preservative period and no further change in the after period. The ratio of phosphoric acid to total nitrogen is notably less in the preservative period and there is a slight further decrease in the after period.

These data show a tendency on the part of the preservative to increase the excretion of sulphates and of phosphoric acid in proportion to the total nitrogen excreted in the urine, and this tendency is continued and somewhat accentuated in the case of phosphoric acid in the after period. The only marked feature brought out in this

summary is the actual and relative increase in phosphoric acid and this is also uniform for each individual.

In the summary for Nos. 7, 10, 11, and 12, the data show a slight decrease in total nitrogen and total urea nitrogen excreted during the preservative period and this decrease is practically restored in the after period. The percentage of urea nitrogen, expressed in terms of total nitrogen in the urine, is slightly diminished in the preservative period, but is restored in the after period to almost the same percentage as in the fore period. The quantity of urea excreted is diminished in the preservative period and is almost restored in the after period to the figure of the fore period. The total sulphur excreted is almost the same in the three periods, being slightly greater in the after period, while the amount of total sulphates excreted is notably greater in the preservative period and decreases in the after period to almost the same magnitude as in the fore period. The most marked effect in this case, as in the previous summary, is exerted upon the phosphoric acid. The quantity excreted is notably increased in the preservative period and this increase is somewhat accentuated in the after period. The ratios show that the total quantities of sulphur, sulphates, and phosphoric acid excreted in proportion to the nitrogen in the urine are all greater in the preservative period, and that this increase is most marked in the case of the phosphoric acid.

The data show a tendency on the part of the preservative to diminish slightly the total quantity of urea excreted and to increase uniformly the relative quantities of sulphur, sulphates, and phosphoric acid in the urine as compared with the total nitrogen.

The general effect produced on the ten men is shown in the summary for Nos. 1 to 12, inclusive, omitting Nos. 8 and 9 because of incomplete data. This general summary indicates a slightly smaller quantity of nitrogen and urea nitrogen excreted during the preservative period, and this diminution is carried further in the after period. The percentage of urea nitrogen excreted, expressed in terms of total nitrogen, is almost the same in the three periods, being very slightly increased in the preservative and after periods as compared with the fore period. The total urea excreted is slightly diminished in the preservative and after periods. The quantity of sulphur excreted is very slightly decreased in the preservative period and is further diminished in the after period. The quantity of sulphates excreted is almost the same in the three periods, showing a negligible decrease in the preservative period. In phosphoric acid, however, there is a notable increase both in the preservative and after periods as compared with the fore period. The ratios show a slightly increased excretion of sulphur and sulphates in relation to the nitrogen in the preservative period, and in the after period the increase is maintained.

There is a notable increase in the relative quantity of phosphoric acid excreted, and this increase is slightly augmented in the after period.

From the study of the individual data and summaries it would appear that the manner of administering the preservative, that is, directly in milk, and after being in contact with the milk two days, has no appreciable effect on the results. The most marked effect shown is the actual and relative increase of phosphoric acid as compared with the nitrogen excreted. There is also a slight tendency manifested to increase the total sulphur and sulphates in relation to the nitrogen, and also to decrease slightly the excretion of urea.

TABLE VI.—*Urine determinations—Urea and ratio of sulphur, sulphates, and phosphates to nitrogen, Series IX.*

[Averages are per day.]

Period.	No. 1.										No. 2.									
	Nitrogen.	Urea nitrogen.		Urea.	Sulphur		Phosphoric acid (P_2O_5).	Ratio.			Nitrogen.	Urea nitrogen.		Urea.	Sulphur		Phosphoric acid (P_2O_5).	Ratio.		
		Total.	In terms of total nitrogen.		As S.	As SO_3.		S:N.	SO_3:N.	P_2O_5:N.		Total.	In terms of total nitrogen.		As S.	As SO_3.		S:N.	SO_3:N.	P_2O_5:N.
Fore period.																				
First subperiod:	*Gms.*	*Gms.*	*Per ct.*	*Gms.*	*Gms.*	*Gms.*	*Grams.*				*Gms.*	*Gms.*	*Per ct.*	*Gms.*	*Gms.*	*Gms.*	*Grams.*			
Total	58.32	53.018	90.91	113.496	4.114	9.099	7.447	1:14.2	1.6.4	1:7.8	76.63	70.452	91.94	150.817	5.095	11.405	12.740	1:15.0	1:6.7	1:6.0
Average	11.66	10.604	.....	22.699	.823	1.820	1.489	.....	.....	.....	15.33	14.090	.....	30.163	1.019	2.281	2.548	.....	.....	.....
Second subperiod:																				
Total	59.64	54.766	91.83	117.238	4.090	9.090	9.412	1:14.6	1:6.6	1:6.3	75.27	70.551	93.73	151.029	4.908	10.990	15.934	1:15.3	1:6.8	1:4.7
Average	11.93	10.953	.....	23.448	.818	1.818	1.882	.....	.....	.....	15.05	14.110	.....	30.206	.982	2.198	3.187	.....	.....	.....
Entire fore period:																				
Total	117.96	107.784	91.37	230.733	8.204	18.189	16.859	1:14.4	1:6.5	1:7.0	151.90	141.003	92.83	301.845	10.003	22.395	28.674	1:15.2	1:6.8	1:5.3
Average	11.80	10.778	.....	23.073	.820	1.819	1.686	.....	.....	.....	15.19	14.100	.....	30.184	1.000	2.240	2.867	.....	.....	.....
Preservative period.																				
First subperiod:																				
Total	59.40	54.302	91.42	116.244	4.322	9.621	10.005	1:13.7	1:6.2	1:5.9	67.96	63.640	93.64	136.234	4.630	10.750	14.308	1:14.7	1:6.3	1:4.7
Average	11.88	10.860	.....	23.249	.864	1.924	2.001	.....	.....	.....	13.59	12.728	.....	27.247	.926	2.150	2.862	.....	.....	.....
Second subperiod:																				
Total	64.48	60.120	93.24	128.690	4.423	10.101	9.569	1:14.6	1:6.4	1:6.7	72.17	67.157	93.05	143.763	5.170	10.834	14.796	1:14.0	1:6.7	1:4.9
Average	12.90	12.024	.....	25.740	.885	2.020	1.914	.....	.....	.....	14.43	13.431	.....	28.753	1.034	2.167	2.959	.....	.....	.....
Third subperiod:																				
Total	61.66	57.232	92.82	122.517	4.253	9.638	10.245	1:14.5	1:6.4	1:6.0	75.62	69.708	92.18	149.224	5.065	11.457	14.664	1:14.9	1:6.6	1:5.2
Average	12.33	11.446	.....	24.503	.851	1.928	2.049	.....	.....	.....	15.12	13.942	.....	29.845	1.013	2.291	2.933	.....	.....	.....
Entire preservative period:																				
Total	185.54	171.654	92.52	367.460	12.998	29.360	29.819	1:14.3	1:6.3	1:6.2	215.75	200.505	92.93	429.221	14.865	33.041	43.768	1:14.5	1:6.5	1:4.9
Average	12.37	11.444	.....	24.497	.867	1.957	1.988	.....	.....	.....	14.38	13.367	.....	28.615	991	2.203	2.918	.....	.....	.....
After period.																				
First subperiod:																				
Total	54.68	50.715	92.75	108.566	4.087	8.795	10.128	1:13.4	1:6.2	1:5.4	71.66	66.553	92.87	142.470	5.107	11.032	14.364	1:14.0	1:6.5	1:5.0
Average	10.94	10.143	.....	21.713	.817	1.759	2.026	.....	.....	.....	14.33	13.311	.....	28.494	1.021	2.206	2.873	.....	.....	.....
Second subperiod:																				
Total	58.84	54.244	92.19	116.120	3.931	9.008	9.679	1:15.0	1:6.5	1:6.1	76.34	70.987	92.99	151.962	5.153	11.731	15.052	1:14.8	1:6.5	1:5.1
Average	11.77	10.849	.....	23.224	786	1.802	1.936	.....	.....	.....	15.27	14.197	.....	30.392	1.031	2.346	3.010	.....	.....	.....
Entire after period:																				
Total	113.52	104.959	92.46	224.686	8.018	17.803	19.807	1:14.2	1:6.4	1:5.7	148.00	137.540	92.93	294.432	10.260	22.763	29.416	1:14.4	1:6.5	1:5.0
Average	11.35	10.496	.....	22.469	.802	1.780	1.981	.....	.....	.....	14.80	13.754	.....	29.443	1.026	2.276	2.942	.....	.....	.....

TABLE VI.—*Urine determinations—Urea and ratio of sulphur, sulphates, and phosphates to nitrogen, Series IX*—Continued.

[Averages are per day.]

Period.	No. 3.										No. 4									
	Nitrogen.	Urea nitrogen.		Urea.	Sulphur.		Phosphoric acid (P_2O_5).	Ratio.			Nitrogen.	Urea nitrogen.		Urea.	Sulphur.		Phosphoric acid (P_2O_5).	Ratio.		
		Total.	In terms of total nitrogen.		As S.	As SO_3.		S:N.	SO_3:N.	P_2O_5:N.		Total.	In terms of total nitrogen.		As S.	As SO_3.		S:N.	SO_3:N.	P_2O_5:N.
Fore period.																				
First subperiod:	*Gms.*	*Gms.*	*Per ct.*	*Gms.*	*Gms.*	*Gms.*	*Grams.*				*Gms.*	*Gms.*	*Per ct.*	*Gms.*	*Gms.*	*Gms.*	*Grams.*			
Total	74.24	68.347	92.06	146.310	4.807	10.885	11.581	1:15.4	1:6.8	1:6.4	68.74	64.655	94.06	138.407	4.367	10.442	10.708	1:15.7	1:6.6	1:6.4
Average	14.85	13.669		29.262	.961	2.177	2.316				13.75	12.931		27.681	.873	2.088	2.142			
Second subperiod:																				
Total	70.60	64.848	91.85	138.820	4.964	10.655	14.664	1:14.2	1:6.6	1:4.8	73.87	70.726	95.74	151.403	4.933	11.276	14.176	1:15.0	1:6.6	1:5.2
Average	14.12	12.970		27.764	.993	2.131	2.933				14.77	14.145		30.281	.987	2.255	2.835			
Entire fore period:																				
Total	144.84	133.195	91.96	285.131	9.771	21.540	26.245	1:14.8	1:6.7	1:5.5	142.61	135.381	94.93	289.810	9.300	21.718	24.884	1:15.3	1:6.6	1:5.7
Average	14.48	13.320		28.513	.977	2.154	2.625				14.26	13.538		28.981	.930	2.172	2.488			
Preservative period.																				
First subperiod:																				
Total	71.58	66.079	92.31	141.455	4.777	11.450	13.868	1:15.0	1:6.3	1:5.2	73.11	67.012	91.66	143.453	5.097	11.677	14.202	1:14.3	1:6.3	1:5.1
Average	14.32	13.216		28.291	.955	2.290	2.774				14.62	13.402		28.691	1.019	2.335	2.840			
Second subperiod:																				
Total	70.90	66.207	93.38	141.729	4.844	10.725	13.801	1:14.6	1:6.6	1:5.1	73.29	68.928	94.05	147.554	4.852	10.914	13.247	1:15.1	1:6.7	1:5.5
Average	14.18	13.241		28.346	.969	2.145	2.760				14.66	13.786		29.511	.970	2.183	2.649			
Third subperiod:																				
Total	67.66	66.364	98.08	142.065	4.513	10.268	13.180	1:15.0	1:6.6	1:5.1	72.72	69.422	95.46	148.612	4.944	11.021	12.916	1:14.7	1:6.6	1:5.6
Average	13.53	13.273		28.413	.903	2.054	2.636				14.54	13.884		29.722	.989	2.204	2.583			
Entire preservative period:																				
Total	210.14	198.650	94.53	425.250	14.134	32.443	40.849	1:14.9	1:6.5	1:5.1	219.12	205.362	93.72	439.618	14.893	33.612	40.365	1:14.7	1:6.5	1:5.4
Average	14.01	13.243		28.350	.942	2.163	2.723				14.61	13.691		29.308	.993	2.241	2.691			
After period.																				
First subperiod:																				
Total	69.18	63.670	92.04	136.298	4.933	10.918	13.533	1:14.0	1:6.3	1:5.1	65.40	61.216	93.60	131.045	4.680	10.710	12.570	1:14.0	1:6.1	1:5.2
Average	13.84	12.734		27.260	.987	2.184	2.707				13.08	12.243		26.209	.936	2.142	2.514			
Second subperiod:																				
Total	69.15	62.980	91.08	134.821	4.712	10.803	13.947	1:14.7	1:6.4	1:5.0	68.22	63.553	93.16	136.048	4.458	10.371	12.831	1:15.3	1:6.6	1:5.3
Average	13.83	12.596		26.964	.942	2.161	2.789				13.64	12.711		27.210	.892	2.074	2.566			
Entire after period:																				
Total	138.33	126.650	91.56	271.119	9.645	21.721	27.480	1:14.3	1:6.4	1:5.0	133.62	124.769	93.38	267.093	9.138	21.081	25.401	1:14.6	1:6.3	1:5.3
Average	13.83	12.665		27.112	.965	2.172	2.748				13.36	12.477		26.709	.914	2.108	2.540			

TABLE VI.—*Urine determinations—Urea and ratio of sulphur, sulphates, and phosphates to nitrogen, Series IX*—Continued.

[Averages are per day.]

Period.	No. 5.										No. 6.									
	Nitrogen.	Urea nitrogen.		Urea.	Sulphur.		Phosphoric acid (P_2O_5).	Ratio.			Nitrogen.	Urea nitrogen.		Urea.	Sulphur.		Phosphoric acid (P_2O_5).	Ratio.		
		Total.	In terms of total nitrogen.		As S.	As SO_3.		S:N.	SO_3:N.	P_2O_5:N.		Total.	In terms of total nitrogen.		As S.	As SO_3.		S:N.	SO_3:N.	P_2O_5:N
Fore period.																				
First subperiod:	*Gms.*	*Gms.*	*Per ct.*	*Gms.*	*Gms.*	*Gms.*	*Grams.*				*Gms.*	*Gms.*	*Per ct.*	*Gms.*	*Gms.*	*Gms.*	*Grams.*			
Total	57.83	51.563	89.16	110.381	3.863	8.797	8.362	1:15.0	1:6.6	1:6.9	58.25	48.459	83.19	103.736	3.810	8.406	9.109	1:15.3	1:6.9	1:6.4
Average	11.57	10.313	.....	22.076	.773	1.759	1.672	.....	.....	.....	11.65	9.692	.....	20.747	.762	1.681	1.822	.....	.....	.....
Second subperiod:																				
Total	60.76	57.103	93.98	122.240	4.306	9.281	12.626	1:14.1	1:6.5	1:4.8	61.46	56.744	92.33	121.472	4.383	9.754	9.938	1:14.0	1:6.3	1:6.2
Average	12.15	11.421	.....	24.448	.861	1.856	2.525	.....	.....	.....	12.29	11.349	.....	24.294	.877	1.951	1.988	.....	.....	.....
Entire fore period:																				
Total	118.59	108.666	91.63	232.621	8.169	18.078	20.988	1:14.5	1:6.6	1:5.7	119.71	105.203	87.88	225.208	8.193	18.160	19.047	1:14.6	1:6.6	1:6.3
Average	11.86	10.867	.....	23.262	.817	1.808	2.099	.....	.....	.....	11.97	10.520	.....	22.521	.819	1.816	1.905	.....	.....	.....
Preservative period.																				
First subperiod:																				
Total	55.89	50.480	90.32	108.063	3.686	8.438	10.896	1:15.2	1:6.6	1:5.1	62.84	57.051	90.79	122.129	4.041	9.469	12.785	1:15.6	1:6.6	1:4.9
Average	11.18	10.096	.....	21.613	.737	1.688	2.179	.....	.....	.....	12.57	11.410	.....	24.426	.808	1.894	2.557	.....	.....	.....
Second subperiod:																				
Total	57.58	53.293	92.55	114.084	3.781	8.611	10.945	1:15.2	1:6.7	1:5.3	59.06	54.298	91.94	116.236	3.834	8.884	11.393	1:15.4	1:6.6	1:5.2
Average	11.52	10.659	.....	22.817	.756	1.722	2.189	.....	.....	.....	11.81	10.860	.....	23.247	.767	1.777	2.279	.....	.....	.....
Third subperiod:																				
Total	55.54	50.422	90.79	107.938	3.704	8.293	10.447	1:15.0	1:6.7	1:5.3	60.92	56.430	92.63	120.800	3.885	8.991	11.390	1:15.7	1:6.8	1:5.3
Average	11.11	10.084	.....	21.588	.741	1.659	2.089	.....	.....	.....	12.18	11.286	.....	24.160	.777	1.798	2.278	.....	.....	.....
Entire preservative period:																				
Total	169.01	154.195	91.23	330.085	11.171	25.342	32.288	1:15.1	1:6.7	1:5.2	182.82	167.779	91.77	359.165	11.760	27.344	35.568	1:15.5	1:6.7	1:5.5
Average	11.27	10.280	.....	22.006	.745	1.689	2.153	.....	.....	.....	12.19	11.185	.....	23.944	.784	1.823	2.371	.....	.....	.....
After period.																				
First subperiod:																				
Total	55.13	49.796	90.32	106.598	3.464	8.372	10.478	1:15.9	1:6.6	1:5.3	55.49	50.085	90.26	107.217	3.546	8.373	10.977	1:15.6	1:6.6	1:5.1
Average	11.03	9.959	.....	21.320	.695	1.674	2.096	.....	.....	.....	11.10	10.017	.....	21.443	.709	1.675	2.195	.....	.....	.....
Second subperiod:																				
Total	62.39	57.097	91.52	122.228	4.131	9.397	11.734	1:15.1	1:6.6	1:5.3	55.42	51.443	92.82	110.124	3.726	8.561	11.085	1:14.9	1:6.5	1:5.0
Average	12.48	11.419	.....	24.446	.826	1.879	2.347	.....	.....	.....	11.08	10.289	.....	22.025	.745	1.712	2.217	.....	.....	.....
Entire after period:																				
Total	117.52	106.893	90.96	228.826	7.595	17.769	22.212	1:15.5	1:6.6	1:5.3	110.91	101.528	91.54	217.341	7.272	16.934	22.062	1:15.3	1:6.5	1:5.0
Average	11.75	10.689	.....	22.883	.760	1.777	2.221	.....	.....	.....	11.09	10.153	.....	21.734	.727	1.693	2.206	.....	.....	.....

TABLE VI.—*Urine determinations—Urea and ratio of sulphur, sulphates, and phosphates to nitrogen, Series IX*—Continued.

[Averages are per day.]

Period.	No. 7.										No. 8.									
	Nitrogen.	Urea nitrogen.		Urea.	Sulphur		Phosphoric acid (P_2O_5).	Ratio.			Nitrogen.	Urea nitrogen.		Urea.	Sulphur.		Phosphoric acid (P_2O_5).	Ratio.		
		Total.	In terms of total nitrogen.		As S.	As SO_3.		S:N.	SO_3:N.	P_2O_5:N.		Total.	In terms of total nitrogen.		As S.	As SO_3.		S:N.	SO_3:N.	P_2O_5:N.
Fore period.																				
First subperiod:	*Gms.*	*Gms.*	*Per ct.*	*Gms.*	*Gms.*	*Gms.*	*Grams.*				*Gms.*	*Gms.*	*Per ct.*	*Gms.*	*Gms.*	*Gms.*	*Grams.*			
Total	74.57	68.348	91.66	146.313	4.608	10.744	12.031	1:16.2	1:6.9	1:6.2	84.01	78.208	93.09	167.420	5.560	12.932	12.904	1:15.1	1:6.5	1:6.5
Average	14.91	13.670		29.263	.922	2.149	2.406				16.80	15.642		33.484	1.112	2.586	2.581			
Second subperiod:																				
Total	74.57	68.348	91.66	146.313	4.608	10.744	12.031	1:16.2	1:6.9	1:6.2	80.43	75.184	93.48	160.946	5.526	12.397	15.744	1:14.6	1:6.5	1:5.1
Average	14.91	13.670		29.263	.922	2.149	2.406				16.09	15.037		32.189	1.105	2.479	3.149			
Entire fore period:																				
Total	149.14	136.696	91.66	292.626	9.216	21.488	24.062	1:16.2	1:6.9	1:6.2	164.44	153.392	93.28	328.366	11.086	25.329	28.648	1:14.8	1:6.5	1:5.7
Average	14.91	13.670		29.263	.922	2.149	2.406				16.44	15.339		32.837	1.109	2.533	2.865			
Preservative period.																				
First subperiod:																				
Total	67.63	61.440	90.85	131.525	4.621	10.627	11.556	1:14.6	1:6.4	1:5.9	78.99	68.878	87.20	147.447	5.481	12.545	15.639	1:14.4	1:6.2	1:5.1
Average	13.53	12.288		26.305	.924	2.125	2.311				15.80	13.776		29.489	1.096	2.509	3.128			
Second subperiod:																				
Total	66.72	61.308	91.89	131.242	4.560	10.251	10.982	1:14.6	1:6.5	1:6.1	80.75	74.698	92.51	159.906	5.641	12.901	16.546	1:14.3	1:6.3	1:4.9
Average	13.34	12.262		26.248	.912	2.050	2.196				16.15	14.940		31.981	1.128	2.580	3.309			
Third subperiod.																				
Total	64.65	59.680	92.31	127.757	4.374	9.542	10.509	1:14.8	1:6.8	1:6.2										
Average	12.93	11.936		25.551	.875	1.908	2.102													
Entire preservative period:																				
Total	199.00	182.428	91.67	390.524	13.555	30.420	33.047	1:14.7	1:6.5	1:6.0	159.74	143.576	89.88	307.353	11.122	25.446	32.185	1:14.4	1:6.3	1:5.0
Average	13.27	12.162		26.035	.904	2.028	2.203				15.97	14.358		30.735	1.112	2.545	3.219			
After period.																				
First subperiod:																				
Total	60.65	56.072	92.45	120.033	4.244	9.514	9.968	1:14.3	1:6.4	1:6.1										
Average	12.13	11.214		24.007	.849	1.903	1.994													
Second subperiod:																				
Total	69.61	64.806	93.10	138.730	4.599	10.690	10.509	1:15.1	1:6.5	1:6.6										
Average	13.92	12.961		27.746	.920	2.138	2.102													
Entire after period:																				
Total	130.26	120.878	92.80	258.764	8.843	20.204	20.477	1:14.7	1:6.4	1:6.4										
Average	13.03	12.088		25.876	.884	2.020	2.048													

TABLE VI.—*Urine determinations—Urea and ratio of sulphur, sulphates, and phosphates to nitrogen, Series IX*—Continued.

[Averages are per day.]

Period.	No. 10.										No. 11.									
	Nitrogen.	Urea nitrogen.		Urea.	Sulphur.		Phosphoric acid (P_2O_5).	Ratio.			Nitrogen.	Urea nitrogen.		Urea.	Sulphur.		Phosphoric acid (P_2O_5).	Ratio.		
		Total.	In terms of total nitrogen.		As S.	As SO_3.		S:N.	SO_3:N.	P_2O_5:N.		Total.	In terms of total nitrogen.		As S.	As SO_3.		S:N.	SO_3:N.	P_2O_5:N.
Fore period.																				
First subperiod:	*Gms.*	*Gms.*	*Per ct.*	*Gms.*	*Gms.*	*Gms.*	*Grams.*				*Gms.*	*Gms.*	*Per ct.*	*Gms.*	*Gms.*	*Gms.*	*Grams.*			
Total	80.19	74.725	93.18	159.954	5.668	12.599	12.468	1:14.1	1:6.4	1:6.4	64.82	59.932	92.46	128.296	4.328	9.586	11.008	1:15.0	1:6.8	1:5.9
Average	16.04	14.945		31.993	1.134	2.520	2.494				12.96	11.986		25.659	.866	1.917	2.202			
Second subperiod:																				
Total	78.24	72.314	92.43	154.803	5.507	12.246	14.473	1:14.2	1:6.4	1:5.4	64.49	60.701	94.12	129.943	4.586	10.003	12.477	1:14.1	1:6.4	1:5.2
Average	15.65	14.463		30.961	1.101	2.449	2.895				12.90	12 140		25.989	.917	2.001	2.495			
Entire fore period:																				
Total	158.43	147.039	92.81	314.766	11.175	24.845	26.941	1:14.2	1:6.4	1:5.9	129.31	120.633	93.29	258.239	8.914	19.589	23.485	1:14.5	1:6.6	1:5.5
Average	15.84	14.704		31.477	1.118	2.484	2.694				12.93	12.063		25.824	.891	1.959	2.349			
Preservative period.																				
First subperiod:																				
Total	79.75	73.189	91.77	156.676	5.585	12.395	14.835	1:14.3	1:6.4	1:5.4	63.16	53.505	84.71	114.538	4.508	9.852	13.432	1:14.0	1:6.4	1:4.7
Average	15.95	14.638		31.335	1.117	2.479	2.967				12.63	10.701		22.908	.902	1.970	2.686			
Second subperiod:																				
Total	78.90	73.503	93.16	157.348	5.493	12.347	14.480	1:14.4	1:6.4	1:5.4	68.77	64.752	94.16	138.615	4.834	10.564	13.226	1:14.2	1:6.5	1:5.2
Average	15.78	14.701		31.470	1.099	2.469	2.896				13.75	12.950		27.723	.967	2.113	2.645			
Third subperiod:																				
Total	72.43	67.809	93.62	145.159	5.076	11.328	12.425	1:14.3	1:6.4	1:5.8	67.08	62.568	93.27	133.939	4.598	10.114	13.695	1:14.6	1:6.6	1:4.9
Average	14.49	13.562		29.032	1.015	2.266	2.485				13.42	12.514		26.788	.920	2.023	2.739			
Entire preservative period:																				
Total	231.08	214.501	92.83	459.182	16.154	36.070	41.740	1:14.3	1:6.4	1:5.5	199.01	180.825	90.86	387.092	13.940	30.530	40.353	1:14.3	1:6.5	1:4.8
Average	15.41	14.300		30.612	1.077	2.405	2.783				13.27	12.055		25.806	.929	2.035	2.690			
After period.																				
First subperiod:																				
Total	80.30	75.205	93.66	160.991	5.496	12.484	14.689	1:14.6	1:6.4	1:5.5	69.24	64.879	93.70	138.886	4.839	10.828	13.330	1:14.3	1:6.4	1:5.2
Average	16.06	15.041		32.198	1.099	2.497	2.938				13.85	12.976		27.777	.968	2.166	2.666			
Second subperiod:																				
Total	81.57	75.828	92.96	162.325	5.397	12.318	15.259	1:15.1	1:6.6	1:5.3	71.38	65.783	92.16	140.822	4.657	11.099	14.345	1:15.3	1:6.4	1:5.0
Average	16.31	15.166		32.465	1.079	2.464	3.052				14.28	13.157		28.164	.931	2.220	2.869			
Entire after period.																				
Total	161.87	151.033	93.31	323.316	10.893	24.802	29.948	1:14.8	1:6.5	1:5.4	140.62	130.662	92.92	279.708	9.496	21.927	27.675	1:14.8	1:6.4	1:5.1
Average	16.19	15.103		32.332	1.089	2.480	2.995				14.06	13.066		27.971	950	2.193	2.768			

TABLE VI.—*Urine determinations—Urea and ratio of sulphur, sulphates, and phosphates to nitrogen, Series IX*—Continued.

[Averages are per day.]

Period.	No. 12.									
	Nitrogen.	Urea nitrogen.		Urea.	Sulphur.		Phosphoric acid (P_2O_5).	Ratio.		
		Total.	In terms of total nitrogen.		As S.	As SO_3.		S:N.	SO_3:N.	P_2O_5:N.
Fore period.	*Grams.*	*Grams.*	*Per cent.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*			
First subperiod:										
Total	80.06	74.484	93.04	159.448	5.083	11.562	13.846	1:15.8	1:6.9	1:5.8
Average	16.01	14.897	.....	31.890	1.017	2.312	2.769	.....	.....	.....
Second subperiod:										
Total	65.89	60.679	92.09	129.896	4.439	9.630	12.459	1:14.8	1:6.8	1:5 3
Average	13.18	12.136	.....	25.979	.888	1.926	2.492	.....	.....	.....
Entire fore period:										
Total	145.95	135.163	92.61	289.343	9.522	21 192	26.305	1:15.3	1:6.9	1:5.5
Average	14.60	13.516	.....	28.934	.952	2.119	2 631	.....	.....	.....
Preservative period.										
First subperiod:										
Total	71.84	64.831	90.24	138.784	4.881	10.730	16.335	1:14.7	1:6.7	1:4.4
Average	14.37	12.966	.....	27.757	.976	2.146	3.267	.....	.....	.....
Second subperiod:										
Total	71.78	66.000	91.95	141.286	4.606	10.216	15.428	1:15 6	1:7.0	1:4.7
Average	14.36	13.200	.....	28.257	.921	2.043	3.086	.....	.....	.....
Third subperiod:										
Total	72.33	66.116	91.41	141.535	5.077	10.669	15.080	1:14.2	1:6.8	1:4.8
Average	14.47	13.223	.....	28.307	1.015	2.134	3.016	.....	.....	.....
Entire preservative period:										
Total	215.95	196.947	91.20	421.604	14.564	31.615	46.843	1:14.8	1:6.8	1:4.6
Average	14.40	13.130	.....	28.107	.971	2.108	3.123	.....	.....	.....
After period.										
First subperiod:										
Total	73.30	67.114	91.56	143.671	4.995	11.085	15.326	1:14.7	1:6.6	1:4.8
Average	14.66	13.423	.....	28.734	.999	2.217	3.065	.....	.....	.....
Second subperiod:										
Total	75.22	67.551	89.80	144.606	4.956	11.154	16.212	1:15.2	1:6.7	1:4 6
Average	15.04	13.510	.....	28.921	.991	2.231	3.242	.....	.....	.....
Entire after period:										
Total	148.52	134.665	90.67	288.277	9.951	22.239	31.538	1:14.9	1:6.7	1:4.7
Average	14.85	13.466	.....	28.828	.995	2.224	3.154	.....	.....	.....

TABLE VI.—*Urine determinations—Urea and ratio of sulphur, sulphates, and phosphates to nitrogen, Series IX*—Continued.

SUMMARIES.

[Averages are per man per day.]

Period.	Nos. 1 to 6.										Nos. 7, 10, 11, and 12.									
	Nitrogen.	Urea nitrogen.		Urea.	Sulphur.		Phosphoric acid (P_2O_5)	Ratio.			Nitrogen.	Urea nitrogen.		Urea.	Sulphur.		Phosphoric acid (P_2O_5)	Ratio.		
		Total.	In terms of total nitrogen.		As S.	As SO_3.		S:N.	SO_3:N.	P_2O_5:N.		Total.	In terms of total nitrogen.		As S.	As SO_3.		S:N.	SO_3:N.	P_2O_5:N.
Fore period.																				
First subperiod:	*Grams.*	*Grams.*	*Per ct.*	*Grams.*	*Gms.*	*Gms.*	*Gms.*				*Gms.*	*Gms.*	*Per ct.*	*Grams.*	*Gms.*	*Gms.*	*Gms.*			
Total	391.01	356.494	90.48	763.147	26.056	59.034	59.947	1:15.1	1:6.7	1:6.6	299.64	277.489	92.61	594.021	19.687	44.491	49.353	1:15.2	1:6.7	1:6.1
Average	13.13	11.883	.....	25.438	.869	1.968	1.998	.....	.....	.....	14.98	13.874	.....	29.701	.984	2.225	2.468	.....	.....	.....
Second subperiod:																				
Total	401.60	374.738	93.31	802.202	27.584	61.046	76.750	1:14.6	1:6.6	1:5.2	283.19	262.042	92.53	560.953	19.140	42.623	51.440	1:14.8	1:6.6	1:5.5
Average	13.39	12.491	.....	26.740	.919	2.035	2.558	.....	.....	.....	14.16	13.102	.....	28.048	.957	2.131	2.572	.....	.....	.....
Entire fore period:																				
Total	795.61	731.232	91.91	1,565.348	53.640	120.080	136.697	1:14.8	1:6.6	1:5.8	582.83	539.531	92.57	1,154.974	38.827	87.114	100.793	1:15.0	1:1.7	1:5.8
Average	13.26	12.187	.....	26.089	.894	2.001	2.278	.....	.....	.....	14.57	13.488	.....	28.874	.971	2.178	2.520	.....	.....	.....
Preservative period.																				
First subperiod:																				
Total	390.78	358.564	91.75	767.578	26.553	61.405	76.064	1:14.7	1:6.4	1.5.1	282.38	252.965	89.58	541.522	19.595	43.604	56.158	1:14.4	1:6.5	1:5.0
Average	13.03	11.952	.....	25.586	.885	2.047	2.535	.....	.....	.....	14.12	12.648	.....	27.076	.980	2.180	2.808	.....	.....	.....
Second subperiod:																				
Total	397.48	370.003	93.09	792.065	26.904	60.069	73.751	1:14.8	1:6.6	1:5.4	286.17	265.563	92.80	568.491	19.493	43.378	54.116	1:14.7	1:6.6	1:5.3
Average	13.25	12.333	.....	26.402	.897	2.002	2.458	.....	.....	.....	14.31	13.278	.....	28.425	.975	2.169	2.706	.....	.....	.....
Third subperiod.																				
Total	394.12	369.578	93.77	791.156	26.364	59.668	72.842	1:14.9	1:6.6	1:5.4	276.49	256.173	92.65	548.390	19.125	41.653	51.709	1:14.5	1:6.6	1:5.3
Average	13.14	12.319	.....	26.372	.879	1.989	2.428	.....	.....	.....	13.82	12.809	.....	27.420	.956	2.083	2.585	.....	.....	.....
Entire preservative period.																				
Total	1,182.38	1,098.145	92.88	2,350.799	79.821	181.142	222.657	1:14.8	1:6.5	1:5.3	845.04	774.701	91.68	1,658.402	58.213	128.635	161.983	1:14.5	1:6.6	1:5.2
Average	13.14	12.202	.....	26.120	.887	2.013	2.474	.....	.....	.....	14.08	12.912	.....	27.640	.970	2.414	2.700	.....	.....	.....
After period.																				
First subperiod:																				
Total	371.54	342.035	92.06	732.194	25.817	58.200	72.050	1:14.4	1:6.4	1:5.2	283.49	263.270	92.87	563.582	19.574	43.911	53.313	1:14.5	1:6.5	1:5.3
Average	12.38	11.401	.....	24.406	.861	1.940	2.402	.....	.....	.....	14.17	13.164	.....	28.179	.979	2.196	2.666	.....	.....	.....
Second subperiod:																				
Total	390.36	360.304	92.30	771.303	26.111	59.871	74.328	1:15.0	1:6.5	1:5.3	297.78	273.968	92.00	586.483	19.609	45.261	56.325	1:15 2	1:6.6	1.5.3
Average	13.01	12.010	.....	25.710	.870	1.996	2.478	.....	.....	.....	14.89	13.698	.....	29.324	.980	2.263	2.816	.....	.....	.....
Entire after period:																				
Total	761.90	702.339	92.18	1,503.497	51.928	118.071	146.378	1:14.7	1:6.5	1:5.2	581.27	537.238	92.42	1,150.065	39.183	89.172	109.638	1:14.8	1:6.5	1:5.3
Average	12.70	11.706	.....	25.058	.865	1.968	2.440	.....	.....	.....	14.53	13.431	.....	28.752	.980	2.229	2.741	.....	.....	.....

TABLE VI.—*Urine determinations—Urea and ratio of sulphur, sulphates, and phosphates to nitrogen, Series IX*—Continued.

SUMMARIES—Continued.

[Averages are per man per day.]

Period.	Nos. 1 to 12, omitting Nos. 8 and 9.									
	Nitrogen.	Urea nitrogen.		Urea.	Sulphur.		Phosphoric acid (P_2O_5).	Ratio.		
		Total.	In terms of total nitrogen.		As S.	As SO_3.		S:N.	SO_3:N.	P_2O_5:N.
Fore period.										
First subperiod:	*Grams.*	*Grams.*	*P. ct.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*			
Total	693.65	633.983	91.40	1,357.167	45.743	103.525	109.300	1:15.2	1:6.7	1:6.4
Average	13.87	12.680		27.143	.915	2.070	2.186			
Second subperiod:										
Total	684.79	636.780	92.99	1,363.155	46.724	103.669	128.190	1:14.7	1:6.6	1:5.3
Average	13.70	12.736		27.263	.932	2.073	2.564			
Entire fore period:										
Total	1,378.44	1,270.763	92.19	2,720.322	92.467	207.194	237.490	1:14.9	1:6.7	1:5.8
Average	13.78	12.708		27.203	.925	2.072	2.375			
Preservative period.										
First subperiod:										
Total	673.16	611.529	90.84	1,309.100	46.148	105.009	132.222	1:14.6	1:6.4	1:5.1
Average	13.46	12.231		26.182	.923	2.100	2.644			
Second subperiod:										
Total	683.65	635.566	92.97	1,360.556	46.397	103.447	127.867	1:14.7	1:6.6	1:5.3
Average	13.67	12.711		27.211	.928	2.069	2.557			
Third subperiod:										
Total	670.61	625.751	93.31	1,339.545	45.489	101.321	124.551	1:14.7	1:6.6	1:5.4
Average	13.41	12.515		26.791	.910	2.026	2.491			
Entire preservative period:										
Total	2,027.42	1,872.846	92.38	4,009.201	138.034	309.777	384.640	1:14.7	1:6.5	1:5.3
Average	13.52	12.486		26.728	.920	2.065	2.564			
After period.										
First subperiod:										
Total	655.03	605.305	92.41	1,295.776	45.391	102.111	125.363	1:14.4	1:6.4	1:5.2
Average	13.10	12.106		25.915	.908	2.042	2.507			
Second subperiod:										
Total	688.14	634.272	92.17	1,357.786	45.720	105.132	130.653	1:15.1	1:6.5	1:5.3
Average	13.76	12.685		27.156	.914	2.103	2.613			
Entire after period:										
Total	1,343.17	1,239.577	92.28	2,653.562	91.111	207.243	256.016	1:14.7	1:6.5	1:5.2
Average	13.43	12.396		26.535	.911	2.072	2.560			

CHANGES IN THE RELATIVE QUANTITIES OF SULPHUR COMPOUNDS IN THE URINE.

INDIVIDUAL DATA.

In the case of No. 1 the most marked change in the distribution of the sulphur compounds in the urine is seen in the increase of inorganic sulphates during the preservative period. The neutral sulphur is decreased, while the ethereal sulphates remain practically constant in amount. The total sulphur is slightly increased in the preservative period and falls in the after period. The ratio of the ethereal sulphates to the inorganic does not show any marked change, being slightly increased during the preservative period. The figures representing the amounts in percentage of the total sulphur show these

variations more clearly and indicate about the same relations as the figures for actual amounts.

In the case of No. 2 practically the opposite results from those shown for No. 1 are found. The total sulphur excreted in this case is slightly decreased during the preservative period and rises during the after period to a quantity greater than in the fore period. The neutral sulphur is increased throughout; the ethereal sulphates, though slightly decreased in the preservative period, are again remarkably constant, while the inorganic sulphates are slightly decreased. The ratio is just a little below the average and remains very constant throughout.

The data for No. 3 in a general way appear to agree with those obtained for No. 1. The total sulphur excreted, however, shows a slight diminution in the preservative period. The neutral sulphur shows a notable decrease in the preservative period, with a tendency to return to normal in the after period; the ethereal sulphates are again practically constant in quantity in the fore and preservative periods, and the inorganic sulphates are also quite constant, being slightly increased in the preservative and after periods. These changes are more markedly shown, in their relation to the total amount of sulphur excreted, by the percentage figures, which show a decrease in neutral sulphur, while in all the other forms there is an increase.

In the case of No. 4 there is a considerable variation shown in the distribution of the sulphur compounds during the three periods. The quantity of total sulphur excreted is somewhat increased during the preservative period and is slightly diminished during the after period. A marked change is shown in the case of neutral sulphur, which is increased by 0.088 gram daily during the preservative period, decreasing in the after period to a quantity but little larger than in the fore period. The ethereal sulphates are quite constant, even in this case being but 0.008 gram less in the preservative period and 0.009 gram less in the after period than in the fore period. The inorganic sulphates are slightly increased during the preservative period and diminished during the after period. The ratio in this instance shows a notable increase during the preservative period, showing a relative decrease in the excretion of ethereal sulphates to inorganic sulphates. In this case the results expressed in the percentage of the total sulphur show a notable increase in the neutral sulphur, and a decrease in all the other forms during the preservative period, just the opposite of the results obtained for No. 3.

The data for No. 5 show quite a marked diminution in the metabolized sulphur during the preservative period. The neutral sulphur and the inorganic sulphates are also notably reduced. In this case the quantity of ethereal sulphates shows more variation than

heretofore, an increase being noted during the preservative period, which with the decrease in the inorganic sulphates causes the ratio of these two forms to decrease to quite an extent during the preservative period. The ratio of the preservative period is practically maintained in the after period. The percentage results show a decrease in the neutral sulphur and a slight increase in all the other constituents, agreeing in this respect with No. 3.

In the case of No. 6 there is a diminution of 0.035 gram of sulphur as S during the preservative period and of 0.092 gram in the after period as compared with the fore period. The neutral sulphur shows a decrease of 0.095 gram during the preservative period and is still further decreased in the after period. The quantity of ethereal sulphur is slightly diminished while there is an increase during the preservative period in the inorganic sulphates, which accounts for the decided increase in the ratio between these substances. The percentage figures show a very marked decrease in the neutral sulphur and a slight decrease in the ethereal sulphates, while the total and inorganic sulphates show a notable increase.

In the case of No. 7 there is a gradual decrease in the total sulphur excreted during the observation. There is an increase in the amount of neutral sulphur and a slight increase in the ethereal sulphates during the preservative period and a decrease in both substances in the after period. The inorganic sulphates are notably reduced during the preservative period and remain the same in the after period. The ratio is therefore somewhat decreased in the preservative and after periods as compared with the fore period. There is quite a marked increase in the percentage figures for neutral sulphur and a slight increase in the case of ethereal sulphates. The total and inorganic sulphates are quite markedly reduced.

The data are incomplete for No. 8, who became ill on December 4, and was consequently dropped from the experiment. The striking feature of the data obtained is the small quantity of ethereal sulphates excreted by this subject.

No. 10 shows a diminution in actual amount of all the forms of sulphur during the preservative period, with the exception of the ethereal sulphates, which remain remarkably constant throughout. There is a tendency manifested to return to the normal during the after period, with the exception of the neutral sulphur, which continues to decrease. The ratio of ethereal to inorganic sulphates is quite constant, being but slightly less in the preservative period. Only very slight variations are shown by the percentage figures, indicating slight increases in all cases except that of neutral sulphur. This contradiction of the figures for actual amounts is due to the greater relative decrease of sulphur as SO_3, on which the percentages are based.

In the case of No. 11 very nearly the opposite results are shown to those obtained in the case of No. 10. The ethereal sulphates are not quite as constant in this instance, being very slightly less in the preservative and after periods than in the fore period. The percentage figures do not show any great variation, but, with one exception (total sulphates) show the same relations as the figures for actual amounts, namely, an increase in total sulphur and inorganic sulphates, and a decrease in total and ethereal sulphates.

No. 12 shows a slight increase in the amount of total sulphur excreted in the preservative period, and a further increase in the after period. There is a notable increase in the neutral sulphur and a slight decrease in the amount of inorganic sulphates during the preservative period, with an increase in both instances in the after period, as compared with the fore period. The ethereal sulphates in this case are again practically constant throughout the observation. The ratio shows very little change in the preservative period, though there is a slight tendency to increase it throughout. The percentage figures show an increase in the amount of neutral sulphur and a decrease in the other forms during the period in which formaldehyde was given, with a tendency to return to the conditions of the fore period in the after period, in all cases except that of ethereal sulphates, which continue to decrease.

SUMMARIES.

The data are first summarized for Nos. 1 to 6, who received the formaldehyde immediately after it was placed in the milk.

In the case of total sulphur, there is a very slight decrease in the excretion during the preservative period which is augmented during the after period. Individually this is shown in four out of the six cases for the preservative period. The neutral sulphur is also decreased during the preservative period and still further decreased during the after period. This change is also shown to have occurred in four out of the six cases here averaged. The ethereal sulphates are practically constant, a fact which was quite noticeable throughout the entire individual data, while the inorganic sulphates are slightly increased during the preservative period and decreased during the after period. The average ratio of ethereal sulphates to the inorganic is 1 : 13.0 in the fore period, 1 : 13.3 in the preservative period, and 1 : 12.5 in the after period, a very slight decrease in the excretion of the ethereal sulphates in relation to the inorganic sulphates, which condition is reversed in the after period. There is a little over 1 per cent decrease in neutral sulphur shown in the figures representing the percentage excretion in the preservative period, and an increase of the same magnitude in inorganic and total sulphates, while the ethereal sulphates are practically the same throughout. During the

after period there is a decrease in the percentage amounts of both the neutral and inorganic sulphates.

From the data in this table there is evidence of a slight tendency to derange the normal relations of the sulphur compounds, but not of a magnitude to warrant ascribing the change entirely to the effect of the preservative administered.

In the summary for Nos. 7, 10, 11, and 12, the subjects who received milk preserved two days with formaldehyde, there is no change in the total sulphur during the preservative period and a very slight increase during the after period. There is a notable increase in the quantity of neutral sulphur during the preservative period, which occurs individually in three of the four subjects, while in the after period the average results show a decrease. The ethereal sulphates are constant throughout, while the inorganic sulphates show a slight decrease, rising again in the after period to a little larger quantity than in the fore period. The ratio conforms to these variations and is slightly smaller in the preservative period and larger in the after period.

In this summary there are also shown differences of slightly more than 1 per cent between the preservative and fore periods (ethereal sulphates excepted, which are again constant). The differences, however, are contrary to the results obtained for Nos. 1 to 6, the neutral sulphur being increased and the inorganic and total sulphates decreased. Thus, there is shown a difference to this extent between these two summaries under the conditions described, but from these data alone the difference is hardly of sufficient magnitude to be ascribed to the form in which the formaldehyde was administered.

The summary for the ten men who completed the experiment, and which is a combination of the above summaries, naturally shows practically no change in the distribution of these elements throughout the entire period of observation, inasmuch as the tendencies shown by the two groups counteract each other.

The only conclusion which can be drawn from the data is the slight tendency evidenced in the case of the formaldehyde-preserved milk to retard the proteid metabolism. In this connection, it should be observed that the balance sheets show an increased ingestion of sulphur in the preservative period, and also a decrease in the excretion of metabolized nitrogen, and a marked increase in the phosphoric acid excreted in the urine.

TABLE VII.—*Urine determinations—Ratio of preformed sulphates to ethereal sulphates and neutral sulphur, Series IX.*

[Averages are per day.]

No. 1.

Period.	Total sulphur as S.	Total sulphur as SO_3.	Neutral sulphur as SO_3.	Total sulphates as SO_3.	Ethereal sulphates as SO_3.	Inorganic sulphates as SO_3.	Ratio ethereal to inorganic sulphates.	Results expressed in per cent of total sulphur in terms of SO_3.			
								Neutral sulphur.	Total sulphates.	Ethereal sulphates.	Inorganic sulphates.
Fore period.											
First subperiod:	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Total	4.114	10.273	1.174	9.099	0.683	8.416	1:12.3	11.43	88.57	6.65	81.92
Average	.823	2.055	.235	1.820	.137	1.683					
Second subperiod:											
Total	4.090	10.213	1.123	9.090	.602	8.488	1:14.1	11.00	89.00	5.89	83.11
Average	.818	2.043	.225	1.818	.120	1.698					
Entire fore period:											
Total	8.204	20.485	2.297	18.189	1.285	16.904	1:13.2				
Average	.820	2.049	.230	1.819	.128	1.690		11.21	88.79	6.27	82.52
Preservative period.											
First subperiod:											
Total	4.322	10.792	1.171	9.621	.609	9.012	1:14.8	10.85	89.15	5.64	83.51
Average	.864	2.158	.234	1.924	.122	802					
Second subperiod:											
Total	4.423	11.044	943	10.101	.598	9.503	1:15.9	8.54	91.46	5.41	86.05
Average	.885	2.209	.189	2.020	.120	1.900					
Third subperiod:											
Total	4.253	10.620	982	9.638	783	8.855	1:11.3	9.25	90.75	7.37	83.38
Average	.851	2.124	.196	1.928	.157	1.771					
Entire preservative period:											
Total	12.998	32.456	3.096	29.360	1.990	27.370	1:13.8				
Average	.867	2.164	.206	1.957	.133	1.825		9.54	90.46	6.13	84.33
After period.											
First subperiod:											
Total	4.087	10.205	1.410	8.795	617	8.178	1:13.3	13.82	86.18	6.05	80.13
Average	.817	2.041	.282	1.759	.123	1.636					
Second subperiod:											
Total	3.931	9.816	.808	9.008	.637	8.371	1:13.1	8.23	91.77	6.49	85.28
Average	.786	1.963	.161	1.802	.127	1.675					
Entire after period:											
Total	8.018	20.021	2.218	17.803	1.254	16.549	1:13.2				
Average	802	2.002	.222	1.780	.125	1.655		11.08	88.92	6.26	82.66

TABLE VII.—*Urine determinations—Ratio of preformed sulphates to ethereal sulphates and neutral sulphur, Series IX*—Continued.

[Averages are per day.]

No. 2.

Period.	Total sulphur as S	Total sulphur as SO_3.	Neutral sulphur as SO_3.	Total sulphates as SO_3.	Ethereal sulphates as SO_3.	Inorganic sulphates as SO_3.	Ratio ethereal to inorganic sulphates.	Results expressed in per cent of total sulphur in terms of SO_3.			
								Neutral sulphur.	Total sulphates.	Ethereal sulphates.	Inorganic sulphates.
Fore period.											
First subperiod:	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Total	5.095	12.722	1.317	11.405	1.199	10.206	1:8.5	10.35	89.65	9.42	80.23
Average	1.019	2.544	.263	2.281	.240	2.041					
Second subperiod:											
Total	4.908	12.255	1.265	10.990	1.079	9.911	1:9.2	10.32	89.68	8.80	80.88
Average	.982	2.451	.253	2.198	.216	1.982					
Entire fore period:											
Total	10.003	24.977	2.582	22.395	2.278	20.117	1:8.8				
Average	1.000	2.498	.258	2.240	.228	2.012		10.34	89.66	9.12	80.54
Preservative period.											
First subperiod:											
Total	4.630	11.561	.811	10.750	1.031	9.719	1:9.4	7.01	92.99	8.92	84.07
Average	.926	2.312	.162	2.150	.206	1.944					
Second subperiod:											
Total	5.170	12.909	2.075	10.834	1.094	9.740	1:8.9	16.07	83.93	8.47	75.46
Average	1.034	2.582	.415	2.167	.219	1.948					
Third subperiod:											
Total	5.065	12.647	1.190	11.457	1.181	10.276	1:8.7	9.41	90.59	9.34	81.25
Average	1.013	2.529	.238	2.291	.236	2.055					
Entire preservative period:											
Total	14.865	37.118	4.077	33.041	3.306	29.735	1:9.0				
Average	.991	2.475	.272	2.203	.220	1.982		10.98	89.02	8.92	80.10
After period.											
First subperiod:											
Total	5.107	12.752	1.720	11.032	1.226	9.806	1:8.0	13.49	86.51	9.61	76.90
Average	1.021	2.550	.344	2.206	.245	1.961					
Second subperiod:											
Total	5.153	12.867	1.136	11.731	1.095	10.636	1:9.7	8.83	91.17	8.51	82.66
Average	1.031	2.573	.227	2.346	.219	2.127					
Entire after period:											
Total	10.260	25.619	2.856	22.763	2.321	20.442	1:8.8				
Average	1.026	2.562	.286	2.276	.232	2.044		11.15	88.85	9.06	79.79

TABLE VII.—*Urine determinations—Ratio of preformed sulphates to ethereal sulphates and neutral sulphur, Series IX*—Continued.

[Averages are per day.]

No. 3.

Period.	Total sulphur as S.	Total sulphur as SO_3.	Neutral sulphur as SO_3.	Total sulphates as SO_3.	Ethereal sulphates as SO_3.	Inorganic sulphates as SO_3.	Ratio ethereal to inorganic sulphates.	Results expressed in per cent of total sulphur in terms of SO_3.			
								Neutral sulphur.	Total sulphates.	Ethereal sulphates.	Inorganic sulphates.
Fore period.											
First subperiod:	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Total	4.807	12.003	1.118	10.885	0.632	10.253	1:16.2	9.31	90.69	5.27	85.42
Average	.961	2.401	.224	2.177	.126	2.051					
Second subperiod:											
Total	4.964	12.395	1.740	10.655	.621	10.034	1:16.2	14.04	85.96	5.01	80.95
Average	.993	2.479	.348	2.131	.124	2.007					
Entire fore period:											
Total	9.771	24.398	2.858	21.540	1.253	20.287	1:16.2				
Average	.977	2.440	.286	2.154	.125	2.029		11.71	88.29	5.14	83.15
Preservative period.											
First subperiod:											
Total	4.777	11.928	.478	11.450	.625	10.825	1:17.3	4.01	95.99	5.24	90.75
Average	.955	2.386	.096	2.290	.125	2.165					
Second subperiod:											
Total	4.844	12.095	1.370	10.725	.626	10.099	1:16.1	11.33	88.67	5.18	83.49
Average	.969	2.419	.274	2.145	.125	2.020					
Third subperiod:											
Total	4.513	11.269	1.001	10.268	.644	9.624	1:14.9	8.88	91.12	5.71	85.41
Average	.903	2.254	.200	2.054	.129	1.925					
Entire preservative period:											
Total	14.134	35.293	2.850	32.443	1.895	30.548	1:16.1				
Average	.942	2.353	.190	2.163	.126	2.037		8.08	91.92	5.37	86.55
After period.											
First subperiod:											
Total	4.933	12.318	1.400	10.918	.658	10.260	1:15.6	11.37	88.63	5.34	83.29
Average	.987	2.464	.280	2.184	.132	2.052					
Second subperiod:											
Total	4.712	11.766	.963	10.803	.701	10.102	1:14.4	8.18	91.82	5.96	85.86
Average	.942	2.353	.192	2.161	.140	2.021					
Entire after period:											
Total	9.645	24.084	2.363	21.721	1.359	20.362	1:15.0				
Average	.965	2.408	.236	2.172	136	2.036		9.81	90.19	5.64	84.55

TABLE VII.—*Urine determinations—Ratio of preformed sulphates to ethereal sulphates and neutral sulphur, Series IX*—Continued.

[Averages are per day.]

No. 4.

Period.	Total sulphur as S.	Total sulphur as SO_3.	Neutral sulphur as SO_3.	Total sulphates as SO_3.	Ethereal sulphates as SO_3.	Inorganic sulphates as SO_3.	Ratio ethereal to inorganic sulphates.	Results expressed in per cent of total sulphur in terms of SO_3.			
								Neutral sulphur.	Total sulphates.	Ethereal sulphates.	Inorganic sulphates.
Fore period.											
First subperiod:	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Total	4.367	10.904	0.462	10.442	0.742	9.700	1:13.1	4.24	95.76	6.80	88.96
Average	.873	2.181	.092	2.088	.148	1.940					
Second subperiod:											
Total	4.933	12.318	1.042	11.276	.729	10.547	1:14.5	8.46	91.54	5.92	85.62
Average	.987	2.464	.208	2.255	.146	2.109					
Entire fore period:											
Total	9.300	23.222	1.504	21.718	1.471	20.247	1:13.8				
Average	.930	2.322	.150	2.172	.147	2.025		6.48	93.52	6.33	87.19
Preservative period.											
First subperiod:											
Total	5.097	12.727	1.050	11.677	.682	10.995	1:16.1	8.25	91.75	5.36	86.39
Average	1.019	2.545	.210	2.335	.136	2.199					
Second subperiod:											
Total	4.852	12.115	1.201	10.914	.728	10.186	1:14.0	9.91	90.09	6.01	84.08
Average	.970	2.423	.240	2.183	.146	2.037					
Third subperiod:											
Total	4.944	12.343	1.324	11.021	.671	10.350	1:15.4				
Average	.989	2.469	.265	2.204	.134	2.070		10.78	89.28	5.44	83.84
Entire preservative period:											
Total	14.893	37.187	3.575	33.612	2.081	31.531	1:15.2				
Average	.993	2.479	.238	2.241	.139	2.102		9.61	90.39	5.60	84.79
After period.											
First subperiod:											
Total	4.680	11.686	.976	10.710	.669	10.041	1:15.0	8.35	91.65	5.72	85.93
Average	.936	2.337	.195	2.142	.134	2.008					
Second subperiod:											
Total	4.458	11.132	.761	10.371	.714	9.657	1:13.5				
Average	.892	2.226	.152	2.074	.143	1.931		6.84	93.16	6.41	86.75
Entire after period:											
Total	9.138	22.818	1.737	21.081	1.383	19.698	1:14.2				
Average	.914	2.282	.174	2.108	.138	1.970		7.61	92.39	6.06	86.33

TABLE VII.—*Urine determinations—Ratio of preformed sulphates to ethereal sulphates and neutral sulphur, Series IX*—Continued.

[Averages are per day.]

No. 5.

Period.	Total sulphur as S.	Total sulphur as SO_3.	Neutral sulphur as SO_3.	Total sulphates as SO_3.	Ethereal sulphates as SO_3.	Inorganic sulphates as SO_3.	Ratio ethereal to inorganic sulphates.	Results expressed in per cent of total sulphur in terms of SO_3.			
								Neutral sulphur.	Total sulphates.	Ethereal sulphates.	Inorganic sulphates.
Fore period.											
First subperiod:	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Total	3.863	9.646	0.849	8.797	0.470	8.327	1:17.7	8.80	91.20	4.87	86.33
Average	.773	1.929	.170	1.759	.094	1.665					
Second subperiod:											
Total	4.306	10.752	1.471	9.281	.583	8.698	1:14.9	13.68	86.32	5.42	80.90
Average	.861	2.150	.294	1.856	.117	1.740					
Entire fore period:											
Total	8.169	20.398	2.320	18.078	1.053	17.025	1:16.2				
Average	.817	2.040	.232	1.808	.105	1.702		11.37	88.63	5.16	83.47
Preservative period.											
First subperiod:											
Total	3.686	9.204	.766	8.438	.591	7.847	1:13.3	8.32	91.68	6.42	85.26
Average	.737	1.841	.153	1.688	.118	1.569					
Second subperiod:											
Total	3.781	9.441	.830	8.611	.652	7.959	1:12.2	8.79	91.21	6.91	84.30
Average	.756	1.888	.166	1.722	.130	1.592					
Third subperiod:											
Total	3.704	9.249	.956	8.293	.591	7.702	1:13.0	10.34	89.66	6.39	83.27
Average	.741	1.850	.191	1.659	.118	1.540					
Entire preservative period:											
Total	11.171	27.894	2.552	25.342	1.834	23.508	1:12.8				
Average	.745	1.860	.170	1.689	.122	1.567		9.15	90.85	6.57	84.28
After period.											
First subperiod:											
Total	3.464	8.650	.277	8.373	.652	7.721	1:11.8	3.20	96.80	7.54	89.26
Average	.693	1.730	.055	1.675	.130	1.544					
Second subperiod:											
Total	4.131	10.315	.918	9.397	.628	8.769	1:14.0	8.90	91.10	6.09	85.01
Average	.826	2.063	.184	1.879	.126	1.754					
Entire after period:											
Total	7.595	18.965	1.195	17.770	1.280	16.490	1:12.9				
Average	.760	1.896	.120	1.777	.128	1.649		6.30	93.70	6.77	86.95

TABLE VII.—*Urine determinations—Ratio of preformed sulphates to ethereal sulphates and neutral sulphur, Series IX*—Continued.

[Averages are per day.]

No. 6.

Period.	Total sulphur as S.	Total sulphur as SO_3.	Neutral sulphur as SO_3.	Total sulphates as SO_3.	Ethereal sulphates as SO_3.	Inorganic sulphates as SO_3.	Ratio ethereal to inorganic sulphates.	Results expressed in per cent of total sulphur in terms of SO_3.			
								Neutral sulphur.	Total sulphates.	Ethereal sulphates.	Inorganic sulphates.
Fore period.											
First subperiod:	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Total	3.810	9.514	1.108	8.406	0.627	7.779	1:12.4	11.65	88.35	6.59	81.76
Average	.762	1.903	.222	1.681	.125	1.556					
Second subperiod:											
Total	4.383	10.944	1.190	9.754	.586	9.168	1:15.6	10.87	89.13	5.35	83.78
Average	.877	2.189	.238	1.951	.117	1.834					
Entire fore period:											
Total	8.193	20.458	2.298	18.160	1.213	16.947	1:14.0				
Average	.819	2.046	.230	1.816	.121	1.695		11.23	88.77	5.93	82.84
Preservative period.											
First subperiod.											
Total	4.041	10.090	.621	9.469	.471	8.998	1:19.1	6.15	93.85	4.67	88.18
Average	.808	2.018	.124	1.894	.094	1.800					
Second subperiod:											
Total	3.834	9.573	.689	8.884	.494	8.390	1:17.0	7.20	92.80	5.16	87.64
Average	.767	1.915	.138	1.777	.099	1.678					
Third subperiod:											
Total	3.885	9.701	.710	8.991	.603	8.388	1:13.9	7.32	92.68	6.22	86.46
Average	.777	1.940	.142	1.798	.121	1.677					
Entire preservative period:											
Total	11.760	29.365	2.021	27.344	1.568	25.776	1:16.4				
Average	.784	1.958	.135	1.823	.105	1.718		6.88	93.12	5.34	87.78
After period.											
First subperiod:											
Total	3.546	8.854	.481	8.373	.551	7.822	1:14.2	5.43	94.57	6.22	88.35
Average	.709	1.771	.096	1.675	.110	1.565					
Second subperiod:											
Total	3.726	9.304	.743	8.561	.599	7.962	1:13.3	7.99	92.01	6.44	85.57
Average	.745	1.861	.149	1.712	.120	1.592					
Entire after period:											
Total	7.272	18.158	1.224	16.934	1.150	15.784	1:13.7				
Average	.727	1.816	.123	1.693	.115	1.578		6.74	93.26	6.33	86.93

TABLE VII.—*Urine determinations—Ratio of preformed sulphates to ethereal sulphates and neutral sulphur, Series IX*—Continued.

[Averages are per day.]

No. 7.

Period.	Total sulphur as S.	Total sulphur as SO_3.	Neutral sulphur as SO_3.	Total sulphates as SO_3.	Ethereal sulphates as SO_3.	Inorganic sulphates as SO_3.	Ratio ethereal to inorganic sulphates.	Results expressed in per cent of total sulphur in terms of SO_3.			
								Neutral sulphur.	Total sulphates.	Ethereal sulphates.	Inorganic sulphates.
Fore period.											
First subperiod:	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Total	4.608	11.506	0.762	10.744	0.716	10.028	1:14.0	6.62	93.38	6.22	87.16
Average	.922	2.301	.152	2.149	.143	2.006					
Second subperiod:											
Total	4.608	11.506	.762	10.744	.716	10.028	1:14.0	6.62	93.38	6.22	87.16
Average	.922	2.301	.152	2.149	.143	2.006					
Entire fore period:											
Total	9.216	23.012	1.524	21.488	1.432	20.056	1:14.0				
Average	.922	2.301	.152	2.149	.143	2.006		6.62	93.38	6.22	87.16
Preservative period.											
First subperiod:											
Total	4.621	11.539	.922	10.617	.745	9.872	1:13.3	7.99	92.01	6.46	85.55
Average	.924	2.308	.185	2.123	.149	1.974					
Second subperiod:											
Total	4.560	11.386	1.135	10.251	.785	9.466	1:12.1	9.97	90.03	6.89	83.14
Average	.912	2.277	.227	2.050	.157	1.893					
Third subperiod:											
Total	4.374	10.922	1.380	9.542	.756	8.786	1:11.6	12.64	87.36	6.92	80.44
Average	.875	2.184	.276	1.908	.151	1.757					
Entire preservative period:											
Total	13.555	33.847	3.437	30.410	2.286	28.124	1:12.3				
Average	.904	2.256	.229	2.027	.152	1.875		10.15	89.85	6.75	83.10
After period.											
First subperiod:											
Total	4.244	10.597	1.083	9.514	.679	8.835	1:13.0	10.22	89.78	6.41	83.37
Average	.849	2.119	.216	1.903	.136	1.767					
Second subperiod:											
Total	4.599	11.484	.794	10.690	.771	9.919	1:12.9	6.91	93.09	6.71	86.38
Average	.920	2.297	.159	2.138	.154	1.984					
Entire after period.											
Total	8.843	22.081	1.877	20.204	1.450	18.754	1:12.9				
Average	.884	2.208	.188	2.020	.145	1.875		8.50	91.50	6.57	84.93

TABLE VII.—*Urine determinations—Ratio of preformed sulphates to ethereal sulphates and neutral sulphur, Series IX*—Continued.

[Averages are per day.]

No. 8.

Period.	Total sulphur as S.	Total sulphur as SO_3.	Neutral sulphur as SO_3.	Total sulphates as SO_3.	Ethereal sulphates as SO_3.	Inorganic sulphates as SO_3.	Ratio ethereal to inorganic sulphates.	Results expressed in per cent of total sulphur in terms of SO_3.			
								Neutral sulphur.	Total sulphates.	Ethereal sulphates.	Inorganic sulphates.
Fore period.											
First subperiod:	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Total	5.560	13.883	0.951	12.932	0.524	12.408	1:23.7	6.85	93.15	3.77	89.38
Average	1.112	2.777	.190	2.586	.105	2.482					
Second subperiod:											
Total	5.526	13.798	1.399	12.397	.432	11.965	1:27.7	10.16	89.84	3.13	86.71
Average	1.105	2.760	.280	2.479	.086	2.393					
Entire fore period:											
Total	11.086	27.682	2.350	25.329	.956	24.373	1:25.5				
Average	1.109	2.768	.235	2.533	.096	2.437		8.50	91.50	3.45	88.05
Preservative period.											
First subperiod:											
Total	5.481	13.686	1.041	12.545	.418	12.127	1:29.0	8.34	91.66	3.05	88.61
Average	1.096	2.737	.208	2.509	.084	2.425					
Second subperiod:											
Total	5.641	14.086	1.185	12.901	.421	12.480	1:29.6	8.41	91.59	2.99	88.60
Average	1.128	2.817	.237	2.580	.084	2.496					
Entire preservative period:											
Total	11.122	27.772	2.326	25.446	.839	24.607	1:29.3				
Average	1.112	2.777	.232	2.545	.084	2.461		8.38	91.62	3.02	88.60

TABLE VII.—*Urine determinations—Ratio of preformed sulphates to ethereal sulphates and neutral sulphur, Series IX*—Continued.

[Averages are per day.]

No. 10.

Period.	Total sulphur as S.	Total sulphur as SO_3.	Neutral sulphur as SO_3.	Total sulphates as SO_3.	Ethereal sulphates as SO_3.	Inorganic sulphates as SO_3.	Ratio ethereal to inorganic sulphates.	Results expressed in per cent of total sulphur in terms of SO_3.			
								Neutral sulphur.	Total sulphates.	Ethereal sulphates.	Inorganic sulphates.
Fore period.											
First subperiod:	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Total	5.668	14.153	1.554	12.599	0.752	11.847	1:15.8	10.98	89.02	5.31	83.71
Average	1.134	2.831	.311	2.520	.150	2.369					
Second subperiod:											
Total	5.507	13.751	1.505	12.246	.813	11.433	1:14.1	10.94	89.06	5.91	83.15
Average	1 101	2.750	.301	2.449	.163	2.287					
Entire fore period:											
Total	11.175	27.904	3.059	24.845	1.565	23.280	1:14.9				
Average	1.118	2.790	.306	2.484	.156	2.328		10.96	89.04	5.61	83.43
Preservative period.											
First subperiod:											
Total	5.585	13.946	1.551	12.395	.750	11.645	1:15.5	11.12	88.88	5.38	83.50
Average	1.117	2.789	.310	2.479	.150	2.329					
Second subperiod:											
Total	5.493	13.716	1.369	12.347	.788	11.559	1:14.7	9.98	90.02	5.75	84.27
Average	1.099	2.743	.274	2.469	.158	2.312					
Third subperiod:											
Total	5.076	12.675	1.347	11.328	.834	10.494	1:12.6	10.63	89.37	6.58	82.79
Average	1.015	2.535	.269	2.266	.167	2.099					
Entire preservative period:											
Total	16.154	40.337	4.267	36.070	2.372	33.698	1:14.2				
Average	1.077	2.689	.284	2.405	.158	2.247		10.58	89.42	5.88	83.54
After period.											
First subperiod:											
Total	5.496	13.724	1.240	12.484	.817	11.667	1:14.3	9.04	90.96	5.95	85.01
Average	1.099	2.745	.248	2.497	.163	2.333					
Second subperiod.											
Total	5.397	13.476	1.158	12.318	.731	11.587	1:15.9	8.59	91.41	5.42	85.99
Average	1.079	2.695	.232	2.464	.146	2.317					
Entire after period:											
Total	10.893	27.200	2.398	24.802	1.548	23.254	1:15.0				
Average	1.089	2.720	.240	2.480	.155	2.325		8.82	91.18	5.69	85.49

TABLE VII.—*Urine determinations—Ratio of preformed sulphates to ethereal sulphates and neutral sulphur, Series IX*—Continued.

[Averages are per day.]

No. 11.

Period.	Total sulphur as S.	Total sulphur as SO_3.	Neutral sulphur as SO_3.	Total sulphates as SO_3.	Ethereal sulphates as SO_3.	Inorganic sulphates as SO_3.	Ratio ethereal to inorganic sulphates.	Results expressed in per cent of total sulphur in terms of SO_3.			
								Neutral sulphur.	Total sulphates.	Ethereal sulphates.	Inorganic sulphates.
Fore period.											
First subperiod:	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Total	4.328	10.807	1.221	9.586	0.606	8.980	1:14.8	11.30	88.70	5.61	83.09
Average	.866	2.161	.244	1.917	.121	1.796					
Second subperiod:											
Total	4.586	11.451	1.448	10.003	.656	9.347	1:14.2	12.65	87.35	5.73	81.62
Average	.917	2.290	.290	2.001	.131	1.869					
Entire fore period:											
Total	8.914	22.258	2.669	19.589	1.262	18.327	1:14.5				
Average	.891	2.226	.267	1.959	.126	1.833		11.99	88.01	5.67	82.34
Preservative period.											
First subperiod:											
Total	4.508	11.256	1.404	9.852	.605	9.247	1:15.3	12.47	87.53	5.37	82.16
Average	.902	2.251	.281	.970	121	1.849					
Second subperiod:											
Total	4.834	12.070	1.506	10.564	.620	9.944	1:16.0	12.48	87.52	5.14	82.38
Average	.967	2.414	.301	2.113	.124	1.989					
Third subperiod:											
Total	4.598	11.481	1.367	10.114	.537	9.577	1:17.8	11.91	88.09	4.68	83.41
Average	.920	2.296	.273	2.023	.107	1.915					
Entire preservative period:											
Total	13.940	34.808	4.278	30.530	1.762	28.768	1:16.3				
Average	.929	2.321	.285	2.035	.117	1.918		12.29	87.71	5.06	82.65
After period.											
First subperiod:											
Total	4.839	12.083	1.255	10.828	.624	10.204	1:16.4	10.39	89.61	5.16	84.45
Average	.968	2.417	.251	2.166	.125	2.041					
Second subperiod.											
Total	4.657	11.629	.530	11.099	.559	10.540	1:18.9	4.56	95.44	4.81	90.63
Average	.931	2.326	.106	2.220	.112	2.108					
Entire after period.											
Total	9.496	23.712	1.785	21.927	1.183	20.744	1:17.5				
Average	.950	2.371	.178	2.193	.118	2.074		7.53	92.47	4.99	87.48

TABLE VII.—*Urine determinations—Ratio of preformed sulphates to ethereal sulphates and neutral sulphur, Series IX*—Continued.

[Averages are per day.]

No. 12.

Period.	Total sulphur as S.	Total sulphur as SO_3.	Neutral sulphur as SO_3.	Total sulphates as SO_3.	Ethereal sulphates as SO_3.	Inorganic sulphates as SO_3.	Ratio ethereal to inorganic sulphates.	Results expressed in per cent of total sulphur in terms of SO_3.			
								Neutral sulphur.	Total sulphates.	Ethereal sulphates.	Inorganic sulphates.
Fore period.											
First subperiod:	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Total	5.083	12.692	1.130	11.562	0.697	10.865	1:15.6	8.90	91.10	5.49	85.61
Average	1.017	2.538	.226	2.312	.139	2.173					
Second subperiod:											
Total	4.439	11.084	1.454	9.630	.750	8.880	1:11.8	13.12	86.88	6.77	80.11
Average	.888	2.217	.291	1.926	.150	1.776					
Entire fore period:											
Total	9.522	23.776	2.584	21.192	1.447	19.745	1:13.6				
Average	.952	2.378	.258	2.119	.145	1.974		10.87	89.13	6.09	83.04
Preservative period.											
First subperiod:											
Total	4.881	12.188	1.458	10.730	.721	10.009	1:13.9	11.96	88.04	5.92	82.12
Average	.976	2.438	.292	2.146	.144	2.002					
Second subperiod:											
Total	4.606	11.501	1.285	10.216	.672	9.544	1:14.2	11.17	88.83	5.84	82.99
Average	.921	2.300	.257	2.043	.134	1.909					
Third subperiod:											
Total	5.077	12.677	2.008	10.669	.757	9.912	1:13.1	15.84	84.16	5.97	78.19
Average	1.015	2.535	.401	2.134	.151	1.982					
Entire preservative period:											
Total	14.564	36.366	4.751	31.615	2.150	29.465	1:13.7				
Average	.971	2.424	316	2.108	.143	1.965		13.06	86.94	5.91	81.03
After period.											
First subperiod:											
Total	4.995	12.473	1.388	11.085	.683	10.402	1:15.2	11.13	88.87	5.48	83.39
Average	.999	2.495	.278	2.217	.137	2.080					
Second subperiod:											
Total	4.956	12.375	1.221	11.154	.763	10.391	1:13.6	9.87	90.13	6.17	83.96
Average	.991	2.475	.244	2.231	.153	2.078					
Entire after period.											
Total	9.951	24.848	2.609	22.239	1.446	20.793	1:14.4				
Average	.995	2.485	.261	2.224	.145	2.079		10.50	89.50	5.82	83.68

TABLE VII.—*Urine determinations—Ratio of preformed sulphates to ethereal sulphates and neutral sulphur, Series IX*—Continued.

SUMMARIES.

[Averages are per man per day.]

Nos. 1 to 6.

Period.	Total sulphur as S.	Total sulphur as SO_3.	Neutral sulphur as SO_3.	Total sulphates as SO_3.	Ethereal sulphates as SO_3.	Inorganic sulphates as SO_3.	Ratio ethereal to inorganic sulphates.	Results expressed in per cent of total sulphur in terms of SO_3.			
								Neutral sulphur.	Total sulphates.	Ethereal sulphates.	Inorganic sulphates.
Fore period.											
First subperiod:	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*		*P.ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Total	26.056	65.062	6.028	59.034	4.353	54.681	1:12.6	9.27	90.73	6.69	84.04
Average	.869	2.169	.201	1.968	.145	1.823					
Second subperiod:											
Total	27.584	68.877	7.831	61.046	4.200	56.846	1:13.5	11.37	88.63	6.10	82.53
Average	.919	2.296	.261	2.035	.140	1.895					
Entire fore period:											
Total	53.640	133.939	13.859	120.080	8.553	111.527	1:13.0				
Average	.894	2.232	.231	2.001	.143	1.859		10.35	89.65	6.39	83.26
Preservative period.											
First subperiod:											
Total	26.553	66.303	4.898	61.405	4.009	57.396	1:14.3	7.39	92.61	6.05	86.56
Average	.885	2.210	.163	2.047	.134	1.913					
Second subperiod:											
Total	26.904	67.179	7.110	60.069	4.192	55.877					
Average	.897	2.239	.237	2.002	.140	1.863	1:13.3	10.58	89.42	6.24	83.18
Third subperiod:											
Total	26.364	65.831	6.163	59.668	4.473	55.195					
Average	.879	2.194	.205	1.989	.149	1.840	1:12.3	9.36	90.64	6.79	83.85
Entire preservative period:											
Total	79.821	199.313	18.171	181.142	12.674	168.468	1:13.3				
Average	.887	2.215	.202	2.013	.141	1.872		9.12	90.88	6.36	84.52
After period.											
First subperiod:											
Total	25.817	64.465	6.264	58.201	4.373	53.828	1:12.3	9.72	90.28	6.78	83.50
Average	.861	2.149	.209	1.940	.146	1.794					
Second subperiod:											
Total	26.111	65.199	5.328	59.871	4.374	55.497	1:12.7	8.17	91.83	6.71	85.12
Average	.870	2.173	.177	1.996	.146	1.850					
Entire after period:											
Total	51.928	129.664	11.592	118.072	8.747	109.325	1:12.5				
Average	.865	2.161	.193	1.968	.146	1.822		8.94	91.06	6.75	84.31

TABLE VII.—*Urine determinations—Ratio of preformed sulphates to ethereal sulphates and neutral sulphur, Series IX*—Continued.

SUMMARIES—Continued.

[Averages are per man per day.]

Nos. 7, 10, 11, and 12.

Period.	Total sulphur as S.	Total sulphur as SO_3.	Neutral sulphur as SO_3.	Total sulphates as SO_3.	Ethereal sulphates as SO_3.	Inorganic sulphates as SO_3.	Ratio ethereal to inorganic sulphates.	Results expressed in per cent of total sulphur in terms of SO_3.			
								Neutral sulphur.	Total sulphates.	Ethereal sulphates.	Inorganic sulphates.
Fore period.											
First subperiod:	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Total	19.687	49.158	4.667	44.491	2.771	41.720	1:15.1	9.49	90.51	5.64	84.87
Average	.984	2.458	.233	2.225	.139	2.086					
Second subperiod:											
Total	19.140	47.793	5.170	42.623	2.935	39.688	1:13.5	10.82	89.18	6.14	83.04
Average	.957	2.390	.258	2.131	.147	1.984					
Entire fore period:											
Total	38.827	96.951	9.837	87.114	5.706	81.408	1:14.3				
Average	.971	2.424	.246	2.178	.143	2.035		10.15	89.85	5.89	83.96
Preservative period.											
First subperiod:											
Total	19.595	48.929	5.335	43.594	2.821	40.773	1:14.5	10.90	89.10	5.77	83.33
Average	.980	2.446	.267	2.180	.141	2.039					
Second subperiod:											
Total	19.493	48.674	5.296	43.378	2.865	40.513					
Average	.975	2.434	.265	2.169	.143	2.026	1:14.1	10.88	89.12	5.89	83.23
Third subperiod:											
Total	19.125	47.755	6.102	41.653	2.884	38.769					
Average	.956	2.388	.305	2.083	.144	1.938	1:13.4	12.78	87.22	6.04	81.18
Entire preservative period:											
Total	58.213	145.358	16.733	128.625	8.570	120.055	1:14.0				
Average	.970	2.423	.279	2.144	.143	2.001		11.51	88.49	5.90	82.59
After period.											
First subperiod:											
Total	19.574	48.876	4.965	43.911	2.803	41.108	1:14.7	10.16	89.84	5.73	84.11
Average	.979	2.444	.248	2.196	.140	2.055					
Second subperiod:											
Total	19.609	48.964	3.703	45.261	2.824	42.437	1:15.0	7.56	92.44	5.77	86.67
Average	.980	2.448	.185	2.263	.141	2.122					
Entire after period:											
Total	39.183	97.840	8.668	89.172	5.627	83.545	1:14.8				
Average	.980	2.446	.217	2.229	.141	2.089		8.86	91.14	5.75	85.39

TABLE VII.—*Urine determinations—Ratio of preformed sulphates to ethereal sulphates and neutral sulphur, Series IX*—Continued.

SUMMARIES—Continued.

[Averages are per man per day.]

Nos. 1 to 12 (omitting 8 and 9).

Period.	Total sulphur as S.	Total sulphur as SO_3.	Neutral sulphur as SO_3.	Total sulphates as SO_3.	Ethereal sulphates as SO_3.	Inorganic sulphates as SO_3.	Ratio ethereal to inorganic sulphates.	Results expressed in per cent of total sulphur in terms of SO_3.			
								Neutral sulphur.	Total sulphates.	Ethereal sulphates.	Inorganic sulphates.
Fore period.											
First subperiod:	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Total	45.743	114.220	10.695	103.525	7.124	96.401	1:13.5	9.36	90.64	6.24	84.40
Average	.915	2.284	.214	2.070	.142	1.928					
Second subperiod:											
Total	46.724	116.670	13.001	103.669	7.135	96.534	1:13.5	11.14	88.86	6.12	82.74
Average	.934	2.333	.260	2.073	.143	1.931					
Entire fore period:											
Total	92.467	230.890	23.696	207.194	14.259	192.935					
Average	.925	2.309	.237	2.072	.143	1.929	1:13.5	10.26	89.74	6.18	83.56
Preservative period.											
First subperiod:											
Total	46.148	115.232	10.233	104.999	6.830	98.169	1:14.4	8.88	91.12	5.93	85.19
Average	.923	2.305	.205	2.100	.137	1.963					
Second subperiod:											
Total	46.397	115.853	12.406	103.447	7.057	96.390	1:13.7	10.71	89.29	6.09	83.20
Average	.928	2.317	.248	2.069	.141	1.928					
Third subperiod:											
Total	45.489	113.586	12.265	101.321	7.357	93.964	1:12.8	10.80	89.20	6.48	82.72
Average	.910	2.272	.245	2.026	.147	1.879					
Entire preservative period:											
Total	138.034	344.671	34.904	309.767	21.244	288.523					
Average	.920	2.298	.233	2.065	.142	1.923	1:13.6	10.13	89.87	6.16	83.71
After period.											
First subperiod:											
Total	45.391	113.341	11.229	102.112	7.176	94.936	1:13.2	9.91	90.09	6.33	83.76
Average	.908	2.267	.225	2.042	.143	1.899					
Second subperiod:											
Total	45.720	114.163	9.031	105.132	7.198	97.934	1:13.6	7.91	92.09	6.31	85.78
Average	.914	2.283	.181	2.103	.144	1.959					
Entire after period:											
Total	91.111	227.504	20.260	207.244	14.374	192.870					
Average	.911	2.275	.203	2.072	.144	1.929	1:13.4	8.91	91.09	6.32	84.77

MICROSCOPICAL EXAMINATION OF THE URINE.

The figures used to express the relative numbers of microscopic bodies appearing in the urine are the same as in the previous studies, namely, 0, none; 1, very few; 2, few; 3, fairly numerous; 4, numerous; 5, extremely numerous. Five examinations of the urine were made for each subject, one in the fore period and two in both the preservative and after periods, the appearance of microscopic bodies of the various kinds occurring in normal and abnormal urine being noted. In order to bring the data in the tables containing the results of the microscopical observations of the urine into a form convenient for comparison the numbers denoting the relative occurrence of the microscopic organisms have been added together, multiplied by 100, and divided by the number of observations in each case for the fore period, the preservative period, and the after period. These data are placed in the tables under the heading "Relative occurrence."

URIC-ACID CRYSTALS.

No crystals of uric acid are found in any case throughout the observation.

URATES.

Urates are found only in one instance, namely, toward the close of the preservative period in the case of No. 11, when a very few crystals of urates are observed.

CALCIUM-OXALATE CRYSTALS.

These are observed in every case except in the urine of No. 8. A very few are uniformly found in the urine of No. 1, except in the latter part of the preservative period, when none is found.

In the case of No. 2 none is found in the fore period and very few at each observation in the other periods.

No. 3 shows these crystals to be fairly numerous in the fore period, a few and a very few are recorded for the two observations of the preservative period, and the same conditions are maintained in the after period.

The record for No. 4 shows the crystals of calcium oxalate to be fairly numerous in the fore period, a few crystals in the first part of the preservative period, and none at the last observation, while a few and a very few occur at the observations in the after period.

No. 5 shows a very few crystals of calcium oxalate at all the observations except in the first part of the preservative period, when a few are recorded.

Nos. 6, 7, and 12 show very few in all of the periods except the fore period, when none is found.

Nos. 10 and 11 show a very few throughout.

There seems to be no relation here between the administration of the preservative and the occurrence of crystals of calcium oxalate in the urine, though the figures for relative occurrence indicate a slight increase throughout by the percentages 90.9, 95.5, and 110 for the three periods.

CRYSTALLINE PHOSPHATES.

These bodies are found in a few cases only, none occurring in the urine of Nos. 1, 2, 6, 7, 8, and 10. Nos. 4 and 11 show a very few and a few, respectively, in the fore period; No. 3 shows a few and Nos. 4, 5, 11, and 12 a very few once in the preservative period and none at the second observation; Nos. 3 and 12 show a very few and No. 4 a few at the last observation in the after period. The occurrence of these bodies is not affected in a systematic way by the administration of the formaldehyde, the figures for relative occurrence showing the same percentage (27.3) for the fore and preservative periods, with a decrease (20.0) in the after period.

AMORPHOUS PHOSPHATES.

No amorphous phosphates are found in the urine of Nos. 1, 2, 5, 6, 7, 8, and 10. In only two cases (Nos. 4 and 11) were any of these bodies found in the fore period, there being a very few in the former case and numerous particles in the latter. In two cases they occurred in the after period, being extremely numerous at the last observation for No. 4 and only a very few present in the case of No. 12. In the preservative period a few were found at one observation in the case of No. 3. The data for No. 4 show these bodies to be fairly numerous in the first part of the preservative period and extremely numerous at the second observation. In the case of No. 11 they are fairly numerous in the first part of the preservative period, and then disappear.

There seems to be a slight tendency in this case on the part of the formaldehyde to increase the amorphous phosphates in the preservative period, the figures for the relative occurrence being 45.5, 59.1, and 30.0 for the three periods, respectively. But this tendency is not sufficiently marked to warrant any definite conclusion as to the effect produced by the formaldehyde upon the occurrence of amorphous phosphates in the urine.

EPITHELIAL CELLS.

Epithelial cells of the different forms are found uniformly at all the observations except one, the first examination for No. 1 in the preservative period. In five cases very few are reported in the fore period, in five cases a few, and in one case they are fairly numerous. At the first examination in the preservative period only one case is reported as very few, while seven cases show a few, and in two instances they are fairly numerous. At the second test in the preservative period six cases are reported as showing a very few, three a few, and in two cases they are numerous. In the after period the epithelial cells for Nos. 2 and 7 continue numerous, with a slight decrease at the second observation for No. 2, and the cells are in sheets in three out of the four observations. Four cases show a few at both observations, the remainder show a very few or a few at all observations. At 30 per cent of the observations the cells are reported in sheets. There would seem to be a slight tendency again in this case to increase the epithelial cells, the figures for relative occurrence being 163.6, 186.4, and 205.0 for the three periods.

LEUCOCYTES.

Leucocytes appear quite uniformly throughout the observation, the tendency to increase being more marked in the after than in the preservative period. Nos. 1, 3, 4, and 10 show a very few leucocytes

present at each observation. No. 2 shows none in the fore period and a very few at each other observation until the last, when a few are recorded. Nos. 5, 6, 11, and 12 show a very few in the fore period, while for No. 7 they are fairly numerous, and No. 8 shows a few. No. 5 has a few and a very few at the two observations in the preservative period, and the same result is obtained in the after period. No. 6 has only a very few until the last examination in the after period, when a few are recorded. No. 7, whose record shows the highest figures given, has a few present at the beginning of the preservative period; they are fairly numerous at the second examination, and numerous at both observations in the after period. Nos. 11 and 12 have a very few and a few at all observations. The figures for relative occurrence and the individual data indicate an increase in leucocytes throughout, which is more marked in the after period, the percentages being 118.2, 122.7, and 155.0 for the fore, preservative, and after periods.

RED BLOOD CELLS.

No red blood cells are found in the urine during any part of the observation.

HYALINE CASTS.

Hyaline casts are found quite uniformly throughout the period of observation. In three cases (Nos. 1, 7, and 11) none is found in the fore period, while in the preservative period a few or a very few are found at all observations, with the exception of the first examination for No. 7 in the preservative period, and the second examination for Nos. 8 and 10, when none is recorded. Nos. 2 and 5 show a very few throughout, and Nos. 3 and 12 a very few at all observations except the last one, when no hyaline casts are found. There is a tendency shown to increase the numbers of hyaline casts during the preservative period, and the increase is maintained in the after period, 81.8, 104.5, and 105.0 representing the relative occurrence of these bodies in the three periods.

FINELY GRANULAR CASTS.

Finely granular casts are observed at about 40 per cent of the observations, but only a very few are present in any case except that of No. 11, which shows a few at two observations. There is no tendency on the part of the preservative to increase the number, the figures for relative occurrence being smaller in the preservative period than in either the fore or after period.

COARSELY GRANULAR CASTS.

These casts are present at about 38 per cent of the observations and are quite uniformly distributed throughout the three periods. Only a very few casts are present at any one observation, with the exception of one instance in the case of No. 11, when a few are recorded. The figures for relative occurrence are 45.5, 36.4, and 40.0, showing a slightly decreased occurrence in the preservative period.

EPITHELIAL CASTS.

These casts are found only in two instances, both in the preservative period, and only a very few are reported. Their occurrence is probably of no clinical importance.

MUCOUS CYLINDROIDS.

These bodies are present at every observation made and are apparently more prevalent in the preservative and after periods than in the fore period, the figures for relative occurrence being 154.5, 177.3, and 170.0. In six cases in the fore period a few are reported and in five cases a very few. In one case (No. 6) they are reported as fairly numerous or numerous in the preservative and after periods, while in all the other cases there are only a few or a very few. There would seem to be in this case a slight tendency to increase the occurrence of these bodies by the administration of the preservative.

MUCOUS STRANDS.

These strands are present at all observations, a few being present at 34 of the 53 observations. In five instances they are reported as fairly numerous and as numerous at only two observations, both in the preservative period. The relative increase in these bodies in the preservative and after periods is represented by the following figures: 172.7, 190.9, and 210.0 for the three periods, respectively.

The relative number of all of the microscopic bodies occurring in the urine is somewhat increased in the preservative period, rising from a percentage of 63.6 to 70.0, and in the after period this number is again increased to 72.7. Only a slight tendency to increase the occurrence of these bodies can be argued from these figures, and this tendency is not of sufficient uniformity or extent to warrant ascribing any specific effect to the preservative.

TABLE VIII.—*Microscopical examination of the urine, Series IX.*

[None, 0; very few, 1; few, 2; fairly numerous, 3; numerous, 4; extremely numerous, 5.]

URATES.

Number.	Fore period.	Preservative period.		After period.	
	Nov. 17–18.	Nov. 25–26.	Dec. 1–3.	Dec. 9–10.	Dec. 15–17.
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	.....	.....
10	0	0	0	0	0
11	0	0	1	0	0
12	0	0	0	0	0
Total	0	0	1	0	0
Relative occurrence	0	4.5		0	

CRYSTALS OF CALCIUM OXALATE.

1	1	1	0	1	1
2	0	1	1	1	1
3	3	2	1	2	1
4	3	2	0	2	1
5	1	2	1	1	1
6	0	1	1	1	1
7	0	1	1	1	1
8	0	0	0	.....	.....
10	1	1	1	1	1
11	1	1	1	1	1
12	0	1	1	1	1
Total	10	13	8	12	10
Relative occurrence	90.9	95.5		110.0	

CRYSTALLINE PHOSPHATES.

1	0	0	0	0	0
2	0	0	0	0	0
3	0	2	0	0	1
4	1	1	0	0	2
5	0	1	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	.....	.....
10	0	0	0	0	0
11	2	1	0	0	0
12	0	1	0	0	[a]1
Total	3	6	0	0	4
Relative occurrence	27.3	27.3		20.0	

[a] A few of the "coffin lid" type

AMORPHOUS PHOSPHATES.

1	0	0	0	0	0
2	0	0	0	0	0
3	0	2	0	0	0
4	1	3	5	0	5
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	.....	.....
10	0	0	0	0	0
11	4	3	0	0	0
12	0	0	0	0	1
Total	5	8	5	0	6
Relative occurrence	45.5	59.1		30.0	

TABLE VIII.—*Microscopical examination of the urine, Series IX*—Continued.

[None, 0; very few, 1; few, 2; fairly numerous, 3; numerous, 4; extremely numerous, 5.]

EPITHELIAL CELLS.

Number	Fore period	Preservative period.		After period.	
	Nov. 17–18.	Nov. 25–26.	Dec. 1–3.	Dec. 9–10.	Dec. 15–17.
1	1	0	a 1	1	1
2	a 2	a 3	a 4	a 4	a 3
3	1	2	1	2	2
4	2	2	1	2	2
5	2	a 2	1	2	1
6	1	2	a 2	2	2
7	a 3	a 3	a 4	a 4	4
8	1	2	1		
10	a 2	a 2	a 2	a 2	2
11	1	1	1	1	2
12	2	2	2	1	1
Total	18	21	20	21	20
Relative occurrence	163.6	186.4		205.0	

a Few in sheets.

LEUCOCYTES.

1	1	1	1	1	1
2	0	1	1	1	2
3	1	1	1	1	1
4	1	1	1	1	1
5	1	2	1	1	2
6	1	1	1	1	2
7	3	2	3	4	4
8	a 2	1	0		
10	1	1	1	1	1
11	1	1	2	2	2
12	1	2	1	1	1
Total	13	14	13	14	17
Relative occurrence	118.2	122.7		155.0	

a Some in shreds.

HYALINE CASTS.

1	0	1	2	1	1
2	1	1	1	1	1
3	1	1	1	1	0
4	2	1	1	2	1
5	1	1	1	1	1
6	1	1	2	1	0
7	0	0	1	1	1
8	1	1	0		
10	1	2	0	1	2
11	0	2	1	2	2
12	1	1	1	1	0
Total	9	12	11	12	9
Relative occurrence	81.8	104.5		105.0	

FINELY GRANULAR CASTS.

1	0	0	1	0	1
2	1	0	0	0	1
3	1	0	0	1	0
4	1	0	0	1	0
5	1	0	0	1	0
6	0	1	1	0	0
7	0	0	0	0	0
8	1	1	0		
10	0	1	0	0	1
11	0	2	0	2	1
12	1	1	0	0	0
Total	6	6	2	5	4
Relative occurrence	54.5	36.4		45.0	

TABLE VIII.—*Microscopical examination of the urine, Series IX*—Continued.

[None, 0; very few, 1; few, 2; fairly numerous, 3; numerous, 4; extremely numerous, 5.]

COARSELY GRANULAR CASTS.

Number	Fore period.	Preservative period.		After period.	
	Nov. 17–18.	Nov. 25–26	Dec. 1–3.	Dec. 9–10.	Dec. 15–17.
1	0	1	1	0	0
2	1	0	0	0	0
3	0	0	0	1	1
4	1	1	0	1	0
5	0	0	0	1	0
6	0	1	1	0	0
7	0	0	0	0	0
8	0	0	0		
10	1	1	0	1	0
11	1	1	0	2	0
12	1	1	0	1	0
Total	5	6	2	7	1
Relative occurrence	45.5	36.4		40.0	

EPITHELIAL CASTS.

1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	1	0	0
7	0	0	0	0	0
8	0	1	0		
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
Total	0	1	1	0	0
Relative occurrence	0	9.1		0	

MUCOUS CYLINDROIDS.

1	2	1	1	1	2
2	2	2	2	2	2
3	2	2	2	2	1
4	2	2	2	2	1
5	1	1	1	2	1
6	2	2	4	3	4
7	1	2	2	2	1
8	1	2	1		
10	1	2	1	1	1
11	1	2	1	2	1
12	2	2	2	1	2
Total	17	20	19	18	16
Relative occurrence	154.5	177.3		170.0	

MUCOUS STRANDS.

1	3	2	1	2	2
2	1	2	1	2	2
3	2	2	3	3	2
4	1	2	2	3	1
5	1	1	1	2	2
6	2	2	4	3	2
7	2	2	2	2	2
8	2	2	1		
10	2	2	1	2	2
11	1	1	2	2	2
12	2	4	2	2	2
Total	19	22	20	23	19
Relative occurrence	172.7	190.9		210.0	
General summary	105	231		218	
Relative occurrence	63.6	70.0		72.7	

MICROSCOPICAL EXAMINATION OF THE BLOOD.

In Table IX are collected the data showing the results of the examination of the blood, the number of red and white corpuscles and the percentage of hemoglobin therein having been determined. Only one count, however, was made in each period, and therefore the data can only be considered as tentative.

INDIVIDUAL DATA.

The number of red corpuscles in the case of No. 1 increases slightly during the preservative period (155,000), while the number of white corpuscles diminishes by 194, and the percentage of hemoglobin in the blood is increased from 95 to 98. In the after period the red corpuscles and the hemoglobin show a tendency to return to the conditions obtaining in the fore period, while the white corpuscles continue to decrease.

From the data for No. 2 it is seen that there is a marked decrease both in the red and white corpuscles in the preservative period (375,000 and 2,770, respectively). In the case of the red corpuscles a tendency is manifested in the after period to increase the number above that of the fore period. The number of white corpuscles, however, continues to decrease in the after period. The percentage of hemoglobin during the preservative period is less than in either the fore or after period.

No. 3 shows a marked increase in the number of red corpuscles during the preservative period, amounting to 490,000, while in the after period the figure falls again almost to that of the fore period. The number of white corpuscles is also increased during the preservative period, while the hemoglobin is decreased during the preservative period, but increased in the after period.

In the case of No. 4 there is a decided increase in the number of red corpuscles in the blood in the preservative period (390,000), while in the after period they fall to a smaller number than in the fore period. The number of white corpuscles and the percentage of hemoglobin are increased in both the preservative and after periods over the fore period.

In the case of No. 5 there is very little variation in the number of red corpuscles in the preservative period, but the number of white corpuscles is increased. During the after period the number of red corpuscles increases slightly and the number of white corpuscles decreases. The percentage of hemoglobin is the same in the preservative as in the fore period, while in the after period it is slightly greater.

In the case of No. 6 there is a decrease in the number of red corpuscles in the blood in the preservative period amounting to 220,000 and in the white corpuscles of 859, and this decrease is augmented in

the after period. The percentage of hemoglobin remains unchanged in the preservative period and slightly decreases in the after period.

In the case of No. 7 there is a great decrease in both the red and the white corpuscles in the preservative period (1,007,000 and 1,080, respectively). In the after period there is an additional decrease in the number of red corpuscles, while the number of white corpuscles is so enormously increased as to render the figures open to suspicion of error. The percentage of hemoglobin remains unchanged.

No. 10 shows a slight increase in the number of red corpuscles (163,000), a marked decrease of the white corpuscles (1,994), and no change in the percentage of hemoglobin in the preservative period. In the after period the number of red corpuscles is very much decreased, being smaller than in the fore period, while the number of white corpuscles is increased approximately to the number in the fore period. The percentage of hemoglobin remains unchanged throughout the observation.

In the case of No. 11 there is an increase in the number of red corpuscles (320,000) and a decrease in the number of white corpuscles (609) in the preservative period and a slight decrease in the percentage of hemoglobin. In the after period there are fewer red corpuscles than in the preservative period, while the white corpuscles are increased, and the percentage of hemoglobin remains unchanged.

No. 12 shows a marked decrease in the number of red and of white corpuscles (490,000 and 692, respectively), and a decrease in the percentage of hemoglobin in the preservative period. In the after period the number of red corpuscles rises to a larger number than in the fore period, while the number of white corpuscles again decreases. The percentage of hemoglobin increases, being greater than in the fore period.

SUMMARIES.

In the summary for Nos. 1 to 6 the average number of red corpuscles in the blood is increased in the preservative period by 76,666, while the number of white corpuscles is slightly diminished (by 157), and the percentage of hemoglobin slightly increased. In the after period the number of red corpuscles is less than in the fore period, there is a further decrease in the number of white corpuscles, and the percentage of hemoglobin is greater than in either of the other periods.

In the summary for Nos. 7, 10, 11, and 12 there is a notable decrease in the number of red corpuscles, amounting to 253,500, and also of white corpuscles, which are diminished by 1,094, while the percentage of hemoglobin remains unchanged. In the after period there is a further decrease in the number of red corpuscles, but there is an increase in the number of white corpuscles exceeding the figure of the fore period, and the percentage of hemoglobin remains unchanged.

These two summaries lead to conflicting views. There is apparently a tendency on the part of the preservative in the case of Nos. 1 to 6 to increase slightly the number of red corpuscles in the blood, to diminish slightly the number of white corpuscles, and to increase slightly the percentage of hemoglobin. When the formaldehyde is administered after contact with the milk for two days there is a very marked tendency to decrease both the number of red and of white corpuscles.

The average effect produced, shown in the general summary, indicates a slight tendency on the part of the preservative as a whole to diminish the number of red and of white corpuscles, while the hemoglobin remains practically unchanged. Owing to the limited number of observations made and the conflicting evidence offered by the two summaries, no conclusion can be drawn as to the effect of the administration of formaldehyde upon the composition of the blood in respect of the number of its red and white corpuscles and the percentage of coloring matter contained therein, though the tendency to decrease the red corpuscles, shown by Nos. 7, 10, 11, and 12, is much the stronger of the two influences indicated by the data submitted.

TABLE IX.—*Average, by periods, of corpuscles and hemoglobin in the blood, Series IX.*

Period.	No. 1.			No. 2.			No. 3.		
	Red corpuscles per cubic millimeter.	White corpuscles per cubic millimeter.	Hemoglobin.	Red corpuscles per cubic millimeter.	White corpuscles per cubic millimeter.	Hemoglobin.	Red corpuscles per cubic millimeter.	White corpuscles per cubic millimeter.	Hemoglobin.
Fore period	5,495,000	7,756	95	5,150,000	9,778	98	5,185,000	6,094	96
Preservative period	5,650,000	7,562	98	4,775,000	7,008	96	5,675,000	7,257	95
After period	5,585,000	6,731	97	5,390,000	5,290	97	5,275,000	6,786	100

Period.	No. 4.			No. 5.			No. 6.		
	Red corpuscles per cubic millimeter.	White corpuscles per cubic millimeter.	Hemoglobin.	Red corpuscles per cubic millimeter.	White corpuscles per cubic millimeter.	Hemoglobin.	Red corpuscles per cubic millimeter.	White corpuscles per cubic millimeter.	Hemoglobin.
Fore period	5,715,000	4,459	90	5,960,000	7,063	96	5,820,000	8,642	97
Preservative period	6,105,000	5,124	96	5,980,000	8,116	96	5,600,000	7,783	97
After period	5,480,000	5,332	97	6,025,000	5,844	97	5,105,000	7,202	96

Period.	No. 7.			No. 10.		
	Red corpuscles per cubic millimeter.	White corpuscles per cubic millimeter.	Hemoglobin.	Red corpuscles per cubic millimeter.	White corpuscles per cubic millimeter.	Hemoglobin.
Fore period	7,292,000	6,897	98	4,762,000	6,564	97
Preservative period	6,285,000	5,817	98	4,925,000	4,570	97
After period	5,665,000	11,523	98	4,510,000	6,094	97

TABLE IX.—*Average, by periods, of corpuscles and hemoglobin in the blood, Series IX*—Continued.

Period.	No. 11.			No. 12.		
	Red corpuscles per cubic millimeter.	White corpuscles per cubic millimeter.	Hemoglobin.	Red corpuscles per cubic millimeter.	White corpuscles per cubic millimeter.	Hemoglobin.
Fore period	4,635,000	6,952	97	5,140,000	8,143	96
Preservative period	4,955,000	6,343	96	4,650,000	7,451	95
After period	4,885,000	7,202	96	5,285,000	5,678	98

SUMMARIES.

Period.	Nos. 1 to 6.			Nos. 7, 10, 11, and 12.			Nos. 1, 2, 3, 4, 5, 6, 7, 10, 11, and 12.		
	Red corpuscles per cubic millimeter.	White corpuscles per cubic millimeter.	Hemoglobin.	Red corpuscles per cubic millimeter.	White corpuscles per cubic millimeter.	Hemoglobin.	Red corpuscles per cubic millimeter.	White corpuscles per cubic millimeter.	Hemoglobin.
Fore period	5,554,167	7,299	95	5,457,250	7,139	97	5,515,400	7,235	96
Preservative period	5,630,833	7,142	96	5,203,750	6,045	97	5,460,000	6,703	96
After period	5,476,667	6,197	97	5,086,250	7,624	97	5,320,500	6,768	97

METABOLIC PROCESSES.

NITROGEN BALANCE.

INDIVIDUAL DATA.

In the case of No. 1 the daily average quantity of nitrogen in the food is exactly the same in the fore and preservative periods and only 0.36 gram less in the after period. There is practically no change in the quantity of nitrogen excreted in the feces in the preservative period, although there is a tendency to increase the amount throughout, the increase in the after period amounting to 0.2 gram daily despite the slight decrease in the amount of the food. In the urine it is seen that there is an increase of 0.57 gram daily in the quantity of nitrogen excreted during the preservative period, while in the after period the figure falls slightly below that of the fore period. The percentage of nitrogen in the food which occurs in the feces is larger in the preservative period than in the fore period and very much larger in the after period than in the fore period, an increase of 1.58 per cent. The percentage of nitrogen occurring in the urine is 4 per cent greater during the preservative period and decreases in the after period to a figure smaller than in the fore period. The percentage of nitrogen excreted both in the feces and the urine is largest during the preservative period (93.68 per cent) and is approximately 90 per cent in both the fore and after periods. The balances are positive in all cases and of the greatest magnitude in the fore period (1.50 grams) and the least magnitude in the preservative period, namely, 0.91 gram.

In this case the preservative appears to have increased the nitrogen excreted in the urine without producing any notable effect upon that in the feces during the preservative period, with the result that the balance is diminished. In the after period the nitrogen excreted in the feces is markedly increased, while the excretion of metabolized nitrogen returns to the condition of the fore period.

In the case of No. 2 there are very slight variations in the quantity of nitrogen in the food, the average amount in the preservative period being 0.25 gram greater daily and that in the after period 0.20 gram less than in the fore period. The quantity of nitrogen excreted in the feces is practically the same in the fore and preservative periods and notably less (0.31 gram) in the after period. In the urine the greatest quantity of nitrogen is found in the fore period and the least in the preservative period. In the feces and urine together there is not a very great difference in the quantity of nitrogen excreted, but the figure is slightly greater in the fore period and almost the same in the preservative and after periods.

As to the percentage of nitrogen excreted in the feces, it is seen that there is scarcely any difference between the fore and the preservative periods, while that in the after period is decidedly less (1.6 per cent). In regard to the percentage of nitrogen excreted in the urine, it is greatest in the fore period and least in the preservative period, where a diminution of about 6 per cent is shown. The percentage figures for total excretion indicate an inhibition of the excretion of nitrogen during the preservative period amounting to 6 per cent and due entirely to the metabolized nitrogen. The balances in this case are all positive and the largest one is in the preservative period, 1.23 grams, while the balance for the fore period is only 0.19 gram. The data for this man, therefore, are seen to be somewhat contradictory as compared with those for No. 1.

In the case of No. 3 there is practically no variation in the quantity of nitrogen in the food in the fore and preservative periods and only a very slight decrease (0.4 gram) in the after period. The quantity excreted in the feces is very slightly decreased in the preservative period and is notably increased in the after period as compared with the fore period, namely, 0.2 gram. The quantity excreted in the urine is also slightly diminished in the preservative period and is still further decreased in the after period, the entire decrease amounting to 0.65 gram. The total quantity excreted in the feces and urine is least in the preservative period and greatest in the fore period.

The largest percentage of nitrogen excreted in the feces occurs in the after period and the smallest in the preservative period, but the variations are very slight. The largest percentage of nitrogen excreted in the urine is found in the fore period and the smallest

in the preservative period, the greatest variation amounting to almost 3 per cent. The total excretion decreases 3.3 per cent in the preservative period and returns to the conditions of the fore period in the after period. The balances are positive in all cases and are of the greatest magnitude during the preservative period, being almost the same for the fore and after periods. In the preservative period they amount to 2.02 grams, as compared with 1.44 grams in the fore period.

In the case of No. 4 it is seen that the nitrogen in the food in the fore and after periods is almost identical, while in the preservative period it is slightly greater, namely, 0.33 gram daily. The smallest quantity excreted in the feces is found in the fore period (1.63 grams) and the greatest in the after period, namely, 2 grams. The largest quantity is excreted in the urine in the preservative period and the smallest in the after period. In the feces and urine together the largest excretion of nitrogen is found in the preservative period, amounting to 16.36 grams.

The percentage excretion in the feces increases throughout, being 2.17 per cent greater in the after period than in the fore period. In the urine the percentage excretion is almost the same in the fore and preservative periods, but is decreased about 5 per cent in the after period. The percentage of total excretion shows an increase of about 1 per cent in the preservative period, with a decrease of 3.8 per cent in the after period. The balances are all positive and of the greatest magnitude in the after period, amounting to 1.88 grams, and of the least magnitude in the preservative period, or 1.25 grams. Evidently no important effect on the nitrogen metabolism is produced in this case.

In the case of No. 5 the quantity of nitrogen in the food is practically constant in the fore and preservative periods, being very slightly less in the after period (0.29 gram). There is practically no variation in the quantity of nitrogen in the feces in the preservative period, though the largest amount is found in the fore period (1.28 grams) and the smallest in the after period (1.05 grams). The quantity of nitrogen excreted in the urine varies only slightly in the three periods, being largest in the fore period (11.86) and least in the preservative period, when it amounts to 11.27 grams. The quantity of nitrogen in the urine and feces together is largest in the fore period (13.14 grams) and smallest in the preservative period (12.46 grams), but the entire variation is less than 1 gram.

The percentage data for food nitrogen excreted in the feces show little variation, decreasing from 8.74 per cent in the fore period to 7.29 in the after period. The metabolized nitrogen excreted in the urine decreases about 4 per cent in the preservative period and slightly exceeds the figure of the fore period in the after period.

The total percentage excretion decreases about 5 per cent in the preservative period and is almost the same in the after period as in the fore period. The balances are positive in all cases and of the greatest magnitude in the preservative period (2.24 grams), being least in the fore period, for which the figure is 1.55 grams. The only marked variation in this case is in the decreased excretion of metabolized nitrogen in the preservative period and the consequent increase in the balance.

There is but little variation in the quantity of nitrogen in the food in the three periods, an increase of 0.13 gram taking place in the preservative period and a decrease of 0.11 gram in the after period as compared with the fore period in the case of No. 6. There is a loss of nitrogen in the feces in the preservative period of 0.32 gram, and there is practically no further change in the quantity excreted in the after period. The percentage decrease of nitrogen in the food that is excreted in the feces in the preservative period amounts to 2.27 per cent, this loss being maintained in the after period. In the urine there is an increased excretion of 0.22 gram in the preservative period, with a decrease of 1.1 grams in the after period. The percentage data show less than 1 per cent increase in the preservative period, but a decrease of about 6 per cent in the after period. In the feces and urine together the quantity of nitrogen excreted in the preservative period is only slightly decreased (0.1 gram), while it is notably less in the after period (1.11 grams), owing to the decrease in metabolized nitrogen. The percentage data show the same relation, the total decrease in the preservative period amounting to 1.52 per cent and in the after period to 6.11 per cent. The balances are positive in all cases and increase throughout, the figures for the three periods being 1.03, 1.26, and 2.13, respectively.

The data for No. 7 show only slight variation in the quantity of nitrogen in the food, the largest quantity being 16.60 grams in the preservative period, and the smallest 16.20 grams in the after period. There is a notable loss in the amount of nitrogen excreted in the feces in the preservative period, namely, 0.53 gram, and an additional loss of 0.19 gram in the after period. The quantity of nitrogen in the urine also diminishes both in the preservative and in the after period, the total daily decrease in metabolized nitrogen amounting to 1.88 grams. In consequence, the total quantity excreted in the feces and urine is notably diminished in the preservative period (2.19 grams) and a small additional decrease takes place in the after period. The percentage of nitrogen excreted in the feces decreases throughout, the decrease amounting in the preservative period to 3.36 per cent of the amount ingested. There is a decrease of 10.97 per cent of the nitrogen ingested that is excreted in the urine in the preservative period and the percentage excretion in the after period is practically the same as in the

preservative period. The balance is negative in the fore period (−0.48) and increases, being practically the same in the preservative and after periods (1.9 grams).

The data for No. 8 are given, but not discussed, as the illness of the subject, previously explained, deprives them of significance. No. 9 is omitted entirely, as he left the city before the experiment was finished and the data were too incomplete to be of value.

In the case of No. 10 the quantity of nitrogen in the food is slightly decreased in the preservative period (0.83 gram daily). The amount of nitrogen in the feces diminishes slightly in the preservative period, but in the after period it exceeds the figure of the fore period. The amount of nitrogen in the urine is slightly diminished in the preservative period (0.43 gram daily) and is more than restored in the after period. The amount of nitrogen excreted in both feces and urine is largest in the after period and smallest in the preservative period. The percentage data show the same general relations as the figures for actual amounts, with the exception of those for nitrogen in the urine, and for total excretion, in the preservative period, which show a relative increase owing to the slightly decreased amount of nitrogen ingested and the very slight decrease in amount excreted. The excretion of nitrogen in the case of No. 10 appears to have been abnormally stimulated, the balance being negative in all cases, increasing throughout, the figures for the three periods being −0.36, −0.59, and −0.85, respectively. This is an exception to the majority of cases, the balance having been increased in the preservative period in six of the preceding eight cases.

In the case of No. 11 there is only a slight variation in the quantity of nitrogen in the food, an increase of 0.31 gram occurring daily in the preservative period, and a decrease of only 0.1 gram in the after period as compared with the fore period. There is a diminution of the nitrogen in the feces in the preservative period of 0.25 gram daily, and the quantity is restored in the after period to practically the same amount as was excreted in the fore period. There is a slightly greater amount of nitrogen excreted in the urine in the preservative period and a still further increase takes place in the after period, the total daily increase amounting to 1.13 grams. The total amount of nitrogen excreted in the feces and urine is almost the same in the fore and preservative periods and is notably increased in the after period, when it is 1.12 grams greater daily than in the fore period. The percentage data for the excretion of both nonmetabolized and metabolized nitrogen show the same relations as the absolute quantities, the most marked change being the increase of 6.23 per cent in metabolized nitrogen in the after period. The percentage data for total excretion show a decrease of about 1 per cent in the preservative period and an increase of nearly 8 per cent in the after period. The

balance in this case is abnormally large, and positive in all three periods, being slightly increased in the preservative period and decreased 1.44 grams in the after period.

The nitrogen ingested in the preservative period is practically the same as in the fore period, while in the after period there is a slight decrease of 0.43 gram as compared with the fore period. The amount of nitrogen excreted in the feces in the preservative period is increased 0.13 gram (an increase of less than 1 per cent as compared with the amount ingested), while in the after period there is a decrease of 0.5 gram daily, or 2.66 per cent. The metabolized nitrogen excreted in the preservative period shows but little change, namely, a decrease of 0.2 gram, or about 1 per cent, while in the after period there is an increase of 0.45 gram daily, representing 4.6 per cent as compared with the amount ingested. The data for total excretion show practically no change in either the preservative or after period as regards actual amounts, though the percentage data indicate a relative increase in the after period.

The balance is positive throughout and increases very slightly in the preservative period, decreasing again in the after period to a figure below that of the fore period, namely, 0.70 gram. The variations in this case are very slight, but show the same general tendency as the majority of cases, namely, to decrease the excretion, especially of the metabolized nitrogen, and to increase the balance.

SUMMARIES.

The summary for Nos. 1 to 6, inclusive, who received formaldehyde freshly added to the milk, shows a very slight increase in the nitrogen in the food in the preservative period (0.13 gram) and a slight decrease (0.35 gram) in the after period. There is a very slight decrease in the quantity of nitrogen in the feces in the preservative period, but this figure is restored in the after period to practically the same amount as in the fore period. The percentage data show the variations between the three periods to be less than half of 1 per cent. The largest quantity of nitrogen excreted in the urine is in the fore period, 13.26 grams. There is a very slight diminution in the preservative period, amounting to 0.12 gram daily, and a further decrease in the after period of 0.44 gram. The percentage decrease in the preservative period amounts to 1.42 per cent of the amount ingested and in the after period to about 1 per cent additional. In the feces and urine together the largest quantity of nitrogen is excreted in the fore period (14.81 grams) and the smallest in the after period (14.23 grams). The percentage data show a total decreased excretion of 1.82 per cent in the preservative period and practically no further change in the after period, a decrease of only 0.51 per cent being given. The balances are positive in all cases and increase slightly throughout from 1.18 in the fore period to 1.54 in the after period.

In the summary for Nos. 7, 10, 11, and 12, who received formaldehyde mixed with the milk forty-eight hours before it was administered, it is seen that the quantity of nitrogen in the food is practically constant in the three periods. There is a notable decrease in the amount of nitrogen in the feces in the preservative period, amounting to 0.2 gram daily, which is maintained in the after period. The quantity of nitrogen excreted in the urine is practically the same in the fore and after periods and only 0.49 gram less in the preservative than in the fore period. In the feces and urine together the same relations are shown, namely, a slight decrease in the preservative period and a tendency to return to the condition of the fore period in the after period. The percentage data show exactly the same interrelations for the metabolized, nonmetabolized, and total nitrogen excreted, namely, a decrease in the preservative period and an almost complete return to the figures of the fore period in the after period, except that the nitrogen in the feces is further decreased to a very slight extent. The greatest decrease is in the metabolized nitrogen in the preservative period, amounting to 2.4 per cent. The balance is positive in all cases, and is 0.61 gram greater in the preservative period than in the fore period, decreasing again 0.51 in the after period.

The general summary for Nos. 1 to 12, excluding Nos. 8 and 9, shows agreement between the quantity of nitrogen in the food in the fore and preservative periods and a decrease of only 0.25 gram in the after period. There is a slight decrease in the amount of nitrogen in the feces in the preservative period (namely, 0.11 gram), and the amount in the after period is exactly the same as in the preservative period. The percentage data show that the entire variation is within 0.71 per cent as compared with the amount ingested, this representing the decrease in the preservative period. There is a slight decrease in the quantity of nitrogen in the urine in the preservative period and a further decrease in the after period, the total diminution in excretion of metabolized nitrogen amounting only to 0.35 gram per day. This represents a decrease of 1.83 per cent in the preservative period, and the percentage data indicate a relative increase in the after period. The nitrogen excreted in the feces and the urine decreases throughout, the total average decrease being 0.45 gram per day. The percentage data show a total decrease of 2.54 per cent in the preservative period and a very slight increase in the after period (0.93 per cent). The balance is positive in all cases and has the largest magnitude in the preservative period, exceeding the fore period by 0.42 gram daily.

These data show the general effect produced by the preservative to diminish the quantity of nitrogen occurring in the feces and also in the urine. In the individual data there is a remarkable unanimity on this point, there being only three cases out of ten in which the

balance is decreased, and only two cases in which the amount of non-metabolized nitrogen excreted is really increased. In regard to the metabolized nitrogen, Nos. 1, 4, 6, and 11 show slight increases in the amounts excreted, but in three of these cases this is followed by a marked decrease in excretion in the after period, falling below the figure for the fore period. There is thus manifested a tendency to interfere with the metabolism of nitrogen and to increase the amount of nitrogen retained in the body. This interference can not in any way be looked upon as conducive to health, as it would probably in the end tend to burden the body with waste nitrogenous material which could easily prove harmful. Had the weight increased, such a decreased excretion might be considered as an evidence of increased tissue formation, but in connection with the symptoms of positive illness produced and the slight loss in weight this can not be considered as having taken place.

TABLE X.—*Nitrogen balances for Series IX.*

[Averages are per day.]

No. 1.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	72.14	4.70	58.32	63.02				9.12	0.0
Average	14.43	.94	11.66	12.60	6.52	80.84	87.36	1.83	.0
Second subperiod:									
Total	72.67	7.12	59.64	66.76				5.91	.0
Average	14.53	1.42	11.93	13.35	9.80	82.07	91.87	1.18	.0
Entire fore period:									
Total	144.81	11.82	117.96	129.78				15.03	.0
Average	14.48	1.18	11.80	12.98	8.16	81.46	89.62	1.50	.0
Preservative period.									
First subperiod:									
Total	71.32	6.28	59.40	65.68				5.64	.50
Average	14.26	1.26	11.88	13.14	8.81	83.29	92.09	1.12	.10
Second subperiod:									
Total	72.93	5.87	64.48	70.35				2.58	1.00
Average	14.59	1.17	12.90	14.07	8.05	88.41	96.46	.52	.20
Third subperiod:									
Total	73.01	5.83	61.66	67.49				5.52	1.00
Average	14.60	1.17	12.33	13.50	7.99	84.45	92.44	1.10	.20
Entire preservative period:									
Total	217.26	17.98	185.54	203.52				13.74	2.50
Average	14.48	1.20	12.37	13.57	8.28	85.40	93.68	.91	.17
After period.									
First subperiod:									
Total	69.78	6.53	54.68	61.21				8.57	.0
Average	13.96	1.31	10.94	12.24	9.36	78.36	87.72	1.72	.0
Second subperiod:									
Total	71.38	7.22	58.84	66.06				5.32	.0
Average	14.28	1.44	11.77	13.21	10.11	82.43	92.55	1.07	.0
Entire after period:									
Total	141.16	13.75	113.52	127.27				13.89	.0
Average	14.12	1.38	11.35	12.73	9.74	80.42	90.16	1.39	.0

TABLE X.—*Nitrogen balances for Series IX*—Continued.

[Averages are per day.]

No. 2.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams*
Total	85.27	9.49	76.63	86.12				0.85	0.0
Average	17.05	1.90	15.33	17.22	11.13	89.87	101.00	.17	.0
Second subperiod:									
Total	86.05	7.98	75.27	83.25				2.80	.0
Average	17.21	1.60	15.05	16.65	9.27	87.47	96.75	.56	.0
Entire fore period:									
Total	171.32	17.47	151.90	169.37				1.95	.0
Average	17.13	1.75	15.19	16.94	10.20	88.66	98.86	.19	.0
Preservative period.									
First subperiod:									
Total	85.87	9.15	67.96	77.11				8.76	.50
Average	17.17	1.83	13.59	15.42	10.66	79.14	89.80	1.75	.10
Second subperiod:									
Total	86.41	7.64	72.17	79.81				6.60	1.00
Average	17.28	1.53	14.43	15.96	8.84	83.52	92.36	1.32	.20
Third subperiod:									
Total	88.49	9.73	75.62	85.35				3.14	1.00
Average	17.70	1.95	15.12	17.07	11.00	85.46	96.45	.63	.20
Entire preservative period:									
Total	260.77	26.52	215.75	242.27				18.50	2.50
Average	17.38	1.77	14.38	16.15	10.17	82.74	92.91	1.23	.17
After period.									
First subperiod:									
Total	83.59	7.54	71.66	79.20				4.39	.0
Average	16.72	1.51	14.33	15.84	9.02	85.73	94.75	.88	.0
Second subperiod:									
Total	85.75	7.03	76.34	83.37				2.38	.0
Average	17.15	1.41	15.27	16.67	8.20	89.03	97.22	.48	.0
Entire after period:									
Total	169.34	14.57	148.00	162.57				6.77	.0
Average	16.93	1.46	14.80	16.26	8.60	87.40	96.00	.67	.0

TABLE X.—*Nitrogen balances for Series IX*—Continued.

[Averages are per day.]

No. 3.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	88.62	9.22	74.24	83.46				5.16	0.0
Average	17.72	1.84	14.85	16.69	10.40	83.77	94.18	1.03	.0
Second subperiod:									
Total	87.41	7.55	70.60	78.15				9.26	.0
Average	17.48	1.51	14.12	15.63	8.64	80.77	89.41	1.85	.0
Entire fore period:									
Total	176.03	16.77	144.84	161.61				14.42	.0
Average	17.60	1.68	14.48	16.16	9.53	82.28	91.81	1.44	.0
Preservative period.									
First subperiod:									
Total	86.82	8.16	71.58	79.74				7.08	.50
Average	17.36	1.63	14.32	15.95	9.40	82.45	91.85	1.41	.10
Second subperiod:									
Total	87.72	5.91	70.90	76.81				10.91	1.00
Average	17.54	1.18	14.18	15.36	6.74	80.83	87.56	2.18	.20
Third subperiod:									
Total	90.13	10.06	67.66	77.72				12.41	1.00
Average	18.03	2.01	13.53	15.54	11.16	75.07	86.23	2.49	.20
Entire preservative period:									
Total	264.67	24.13	210.14	234.27				30.40	2.50
Average	17.64	1.61	14.01	15.62	9.12	79.40	88.51	2.02	.17
After period.									
First subperiod:									
Total	85.13	6.84	69.18	76.02				9.11	.0
Average	17.03	1.37	13.84	15.20	8.03	81.26	89.30	1.83	.0
Second subperiod:									
Total	87.26	11.94	69.15	81.09				6.17	.0
Average	17.45	2.39	13.83	16.22	13.68	79.25	92.93	1.23	.0
Entire after period:									
Total	172.39	18.78	138.33	157.11				15.28	.0
Average	17.24	1.88	13.83	15.71	10.89	80.24	91.14	1.53	.0

TABLE X.—*Nitrogen balances for Series IX*—Continued.

[Averages are per day.]

No. 4.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	85.37	7.57	68.74	76.31				9.06	0.0
Average	17.07	1.51	13.75	15.26	8.87	80.52	89.39	1.81	.0
Second subperiod:									
Total	87.47	8.74	73.87	82.61				4.86	.0
Average	17.49	1.75	14.77	16.52	9.99	84.45	94.44	.97	.0
Entire fore period:									
Total	172.84	16.31	142.61	158.92				13.92	.0
Average	17.28	1.63	14.26	15.89	9.44	82.51	91.95	1.39	.0
Preservative period.									
First subperiod:									
Total	86.48	8.46	73.11	81.57				4.91	.50
Average	17.30	1.69	14.62	16.31	9.78	84.54	94.32	.99	.10
Second subperiod:									
Total	87.67	8.09	73.29	81.38				6.29	1.00
Average	17.53	1.62	14.66	16.28	9.23	83.60	92.83	1.25	.20
Third subperiod:									
Total	90.05	9.75	72.72	82.47				7.58	1.00
Average	18.01	1.95	14.54	16.49	10.83	80.76	91.58	1.52	.20
Entire preservative period:									
Total	264.20	26.30	219.12	245.42				18.78	2.50
Average	17.61	1.75	14.61	16.36	9.95	82.94	92.89	1.25	.17
After period.									
First subperiod:									
Total	85.39	9.57	65.40	74.97				10.42	.0
Average	17.08	1.91	13.08	14.99	11.21	76.59	87.80	2.09	.0
Second subperiod:									
Total	87.08	10.46	68.22	78.68				8.40	.0
Average	17.42	2.09	13.64	15.74	12.01	78.34	90.35	1.68	.0
Entire after period:									
Total	172.47	20.03	133.62	153.65				18.82	.0
Average	17.25	2.00	13.36	15.37	11.61	77.47	89.09	1.88	.0

TABLE X.—*Nitrogen balances for Series IX*—Continued.

[Averages are per day.]

No. 5.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	73.67	7.21	57.83	65.04				8.63	0.0
Average	14.73	1.44	11.57	13.01	9.79	78.50	88.29	1.72	.0
Second subperiod:									
Total	73.26	5.63	60.76	66.39				6.87	.0
Average	14.65	1.13	12.15	13.28	7.68	82.94	90.62	1.37	.0
Entire fore period:									
Total	146.93	12.84	118.59	131.43				15.50	.0
Average	14.69	1.28	11.86	13.14	8.74	80.71	89.45	1.55	.0
Preservative period.									
First subperiod:									
Total	72.53	5.96	55.89	61.85				10.68	.50
Average	14.51	1.19	11.18	12.37	8.22	77.06	85.28	2.14	.10
Second subperiod:									
Total	72.86	5.98	57.58	63.56				9.30	1.00
Average	14.57	1.20	11.52	12.71	8.21	79.03	87.24	1.86	.20
Third subperiod:									
Total	75.15	6.01	55.54	61.55				13.60	1.00
Average	15.03	1.20	11.11	12.31				2.72	.20
Entire preservative period:									
Total	220.54	17.95	169.01	186.96				33.58	2.50
Average	14.70	1.20	11.27	12.46	8.14	76.63	84.77	2.24	.17
After period.									
First subperiod:									
Total	71.51	5.19	55.13	60.32				11.19	.0
Average	14.30	1.04	11.03	12.06	7.26	77.09	84.35	2.24	.0
Second subperiod:									
Total	72.58	5.31	62.39	67.70				4.88	.0
Average	14.52	1.06	12.48	13.54	7.32	85.96	93.28	.98	.0
Entire after period:									
Total	144.09	10.50	117.52	128.02				16.07	.0
Average	14.41	1.05	11.75	12.80	7.29	81.56	88.85	1.61	.0

TABLE X.—*Nitrogen balances for Series IX*—Continued.

[Averages are per day.]

No. 6.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	73.67	8.21	58.25	66.46				7.21	0.0
Average	14.73	1.64	11.65	13.29	11.14	79.07	90.21	1.44	.0
Second subperiod:									
Total	73.90	9.40	61.46	70.86				3.04	.0
Average	14.78	1.88	12.29	14.17	12.72	83.17	95.89	.61	.0
Entire fore period:									
Total	147.57	17.61	119.71	137.32				10.25	.0
Average	14.76	1.76	11.97	13.73	11.93	81.12	93.05	1.03	.0
Preservative period.									
First subperiod:									
Total	74.18	6.85	62.84	69.69				4.49	.50
Average	14.84	1.37	12.57	13.94	9.23	84.71	93.95	.90	.10
Second subperiod:									
Total	74.27	8.01	59.06	67.07				7.20	1.00
Average	14.85	1.60	11.81	13.41	10.78	79.52	90.31	1.44	.20
Third subperiod:									
Total	74.84	6.70	60.92	67.62				7.22	.70
Average	14.97	1.34	12.18	13.52	8.95	81.40	90.35	1.45	.14
Entire preservative period:									
Total	223.29	21.56	182.82	204.38				18.91	2.20
Average	14.89	1.44	12.19	13.63	9.66	81.88	91.53	1.26	.15
After period.									
First subperiod:									
Total	72.83	6.89	55.49	62.38				10.45	.0
Average	14.57	1.38	11.10	12.48	9.46	76.19	85.65	2.09	.0
Second subperiod:									
Total	73.69	7.37	55.42	62.79				10.90	.0
Average	14.74	1.47	11.08	12.56	10.00	75.21	85.21	2.18	.0
Entire after period:									
Total	146.52	14.26	110.91	125.17				21.35	.0
Average	14.65	1.43	11.09	12.52	9.73	75.70	85.42	2.13	.0

TABLE X.—*Nitrogen balances for Series IX*—Continued.

[Averages are per day.]

No. 7.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	[a] 81.65	9.86	[a] 74.57	84.43				− 2.78	0.0
Average	16.33	1.97	14.91	16.89	12.08	91.33	103.40	− .56	.0
Second subperiod:									
Total	82.45	9.86	74.57	84.43				− 1.98	.0
Average	16.49	1.97	14.91	16.89	11.96	90.44	102.40	− .40	.0
Entire fore period:									
Total	164.10	19.72	149.14	168.86				− 4.76	.0
Average	16.41	1.97	14.91	16.89	12.02	90.88	102.90	− .48	.0
Preservative period.									
First subperiod:									
Total	81.72	7.36	67.63	74.99				+ 6.73	.50
Average	16.34	1.47	13.53	15.00	9.01	82.76	91.76	+ 1.34	.10
Second subperiod:									
Total	83.04	6.73	66.72	73.45				+ 9.59	1.00
Average	16.61	1.35	13.34	14.69	8.10	80.35	88.45	+ 1.92	.20
Third subperiod:									
Total	84.28	7.48	64.65	72.13				+12.15	1.00
Average	16.86	1.50	12.93	14.43	8.88	76.71	85.58	+ 2.43	.20
Entire preservative period:									
Total	249.04	21.57	199.00	220.57				+28.47	2.50
Average	16.60	1.44	13.27	14.70	8.66	79.94	88.57	+ 1.90	.17
After period.									
First subperiod:									
Total	80.20	2.63	60.65	63.28				+16.92	.0
Average	16.04	.53	12.13	12.66	3.28	75.62	78.90	+ 3.38	.0
Second subperiod:									
Total	81.83	9.88	69.61	79.49				+ 2.34	.0
Average	16.37	1.98	13.92	15.90	12.07	85.07	97.14	+ .47	.0
Entire after period:									
Total	162.03	12.51	130.26	142.77				+19.26	.0
Average	16.20	1.25	13.03	14.28	7.72	80.39	88.11	+ 1.92	.0

[a] Average for one day added to complete record.

TABLE X.—*Nitrogen balances for Series IX*—Continued.

[Averages are per day.]

No. 8.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	100.44	9.31	84.01	93.32	.....	.....	.....	7.12	0.0
Average	20.09	1.86	16.80	18.66	9.27	83.64	92.91	1.43	.0
Second subperiod:									
Total	101.27	8.92	80.43	89.35	.....	.....	.....	11.92	.0
Average	20.25	1.78	16.09	17.87	8.81	79.42	88.23	2.38	.0
Entire fore period:									
Total	201.71	18.23	164.44	182.67	.....	.....	.....	19.04	.0
Average	20.17	1.82	16.44	18.27	9.04	81.52	90.56	1.90	.0
Preservative period.									
First subperiod:									
Total	100.39	8.84	78.99	87.83	.....	.....	.....	12.56	.50
Average	20.08	1.77	15.80	17.57	8.81	78.68	87.49	2.51	.10
Second subperiod:									
Total	100.89	9.10	80.75	89.85	.....	.....	.....	11.04	1.00
Average	20.18	1.82	16.15	17.97	9.02	80.04	89.06	2.21	.20
First and second subperiods:									
Total	201.28	17.94	159.74	177.68	.....	.....	.....	23.60	1.50
Average	20.13	1.79	15.97	17.77	8.91	79.36	88.28	2.36	.15

TABLE X.—*Nitrogen balances for Series IX*—Continued.

[Averages are per day.]

No. 10.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	84.21	6.24	80.19	86.43				− 2.22	0.0
Average	16.84	1.25	16.04	17.29	7.41	95.23	102.64	− .45	.0
Second subperiod:									
Total	85.81	8.97	78.24	87.21				− 1.40	.0
Average	17.16	1.79	15.65	17.44	10.45	91.18	101.63	− .28	.0
Entire fore period:									
Total	170.02	15.21	158.43	173.64				− 3.62	.0
Average	17.00	1.52	15.84	17.36	8.95	93.18	102.13	− .36	.0
Preservative period.									
First subperiod:									
Total	85.85	8.51	79.75	88.26				− 2.41	.50
Average	17.17	1.70	15.95	17.65	9.91	92.89	102.81	− .48	.10
Second subperiod:									
Total	86.25	6.18	78.90	85.08				+ 1.17	1.00
Average	17.25	1.24	15.78	17.02	7.17	91.48	98.64	+ .23	.20
Third subperiod:									
Total	70.38	5.66	72.43	78.09				− 7.71	.70
Average	14.08	1.13	14.49	15.62	8.04	102.91	110.95	− 1.54	.14
Entire perservative period:									
Total	242.48	20.35	231.08	251.43				− 8.95	2.20
Average	16.17	1.36	15.41	16.76	8.39	95.30	103.69	− .59	.15
After period.									
First subperiod:									
Total	83.99	8.04	80.30	88.34				− 4.35	.0
Average	16.80	1.61	16.06	17.67	9.57	95.61	105.18	− .87	.0
Second subperiod:									
Total	85.81	8.39	81.57	89.96				− 4.15	.0
Average	17.16	1.68	16.31	17.99	9.78	95.06	104.84	− .83	.0
Entire after period:									
Total	169.80	16.43	161.87	178.30				− 8.50	.0
Average	16.98	1.64	16.19	17.83	9.68	95.33	105.01	− .85	.0

TABLE X.—*Nitrogen balances for Series IX*—Continued.

[Averages are per day.]

No. 11.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	87.78	7.87	64.82	72.69				15.09	0.0
Average	17.56	1.57	12.96	14.54	8.97	73.84	82.81	3.02	.0
Second subperiod:									
Total	89.49	7.48	64.49	71.97				17.52	.0
Average	17.90	1.50	12.90	14.39	8.36	72.06	80.42	3.51	.0
Entire fore period:									
Total	177.27	15.35	129.31	144.66				32.61	.0
Average	17.73	1.54	12.93	14.47	8.66	72.95	81.60	3.26	.0
Preservative period.									
First subperiod:									
Total	88.95	6.09	63.16	69.25				19.70	.50
Average	17.79	1.22	12.63	13.85	6.85	71.01	77.85	3.94	.10
Second subperiod:									
Total	89.72	5.54	68.77	74.31				15.41	1.00
Average	17.94	1.11	13.75	14.86	6.17	76.65	82.82	3.08	.20
Third subperiod:									
Total	91.97	7.71	67.08	74.79				17.18	1.00
Average	18.39	1.54	13.42	14.96	8.38	72.94	81.32	3.43	.20
Entire preservative period:									
Total	270.64	19.34	199.01	218.35				52.29	2.50
Average	18.04	1.29	13.27	14.56	7.15	73.53	80.68	3.48	.17
After period.									
First subperiod:									
Total	87.11	7.19	69.24	76.43				10.68	.0
Average	17.42	1.44	13.85	15.29	8.25	79.49	87.74	2.13	.0
Second subperiod:									
Total	89.19	8.10	71.38	79.48				9.71	.0
Average	17.84	1.62	14.28	15.90	9.08	80.03	89.11	1.94	.0
Entire after period:									
Total	176.30	15.29	140.62	155.91				20.39	.0
Average	17.63	1.53	14.06	15.59	8.67	79.76	88.43	2.04	.0

TABLE X.—*Nitrogen balances for Series IX*—Continued.

[Averages are per day.]

No. 12.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1—4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	87.57	9.19	80.06	89.25				− 1.68	0.0
Average	17.51	1.84	16.01	17.85	10.49	91.42	101.92	− .34	.0
Second subperiod:									
Total	86.54	8.70	65.89	74.59				+11.95	.0
Average	17.31	1.74	13.18	14.92	10.05	76.14	86.19	+ 2.39	.0
Entire fore period:									
Total	174.11	17.89	145.95	163.84				+10.27	.0
Average	17.41	1.79	14.60	16.38	10.28	83.83	94.10	+ 1.03	.0
Preservative period.									
First subperiod:									
Total	85.55	12.53	71.84	84.37				+ 1.18	.50
Average	17.11	2.51	14.37	16.87	14.65	83.97	98.62	+ .24	.10
Second subperiod:									
Total	86.34	8.39	71.78	80.17				+ 6.17	1.00
Average	17.27	1.68	14.36	16.03	9.72	83.14	92.85	+ 1.24	.20
Third subperiod:									
Total	88.72	7.88	72.33	80.21				+ 8.51	1.00
Average	17.74	1.58	14.47	16.04	8.88	81.53	90.41	+ 1.70	.20
Entire preservative period:									
Total	260.61	28.80	215.95	244.75				+15.86	2.50
Average	17.37	1.92	14.40	16.32	11.05	82.86	93.91	+ 1.05	.17
After period.									
First subperiod:									
Total	83.82	7.37	73.30	80.67				+ 3.15	.0
Average	16.76	1.47	14.66	16.13	8.79	87.45	96.24	+ .63	.0
Second subperiod:									
Total	86.00	6.87	75.22	82.09				+ 3.91	.0
Average	17.20	1.37	15.04	16.42	7.99	87.47	95.45	+ .78	.0
Entire after period:									
Total	169.82	14.24	148.52	162.76				+ 7.06	.0
Average	16.98	1.42	14.85	16.28	8.39	87.46	95.84	+ .70	.0

TABLE X.—*Nitrogen balances for Series IX*—Continued.

SUMMARIES.

[Averages are per man per day.]

Nos. 1 to 6.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	478.74	46.40	394.01	440.41	9.69	82.30	91.99	38.33	0.0
Average	15.96	1.55	13.13	14.68	.....	.....	.....	1.28	.0
Second subperiod:									
Total	480.76	46.42	401.60	448.02	9.66	83.53	93.19	32.74	.0
Average	16.03	1.55	13.39	14.93	.....	.....	.....	1.10	.0
Entire fore period:									
Total	959.50	92.82	795.61	888.43	9.67	82.92	92.59	71.07	.0
Average	15.99	1.55	13.26	14.81	.....	.....	.....	1.18	.0
Preservative period.									
First subperiod:									
Total	477.20	44.86	390.78	435.64	9.40	81.89	91.29	41.56	3.00
Average	15.91	1.50	13.03	14.52	.....	.....	.....	1.39	.10
Second subperiod:									
Total	481.86	41.50	397.48	438.98	8.61	82.49	91.10	42.88	6.00
Average	16.06	1.38	13.25	14.63	.....	.....	.....	1.43	.20
Third subperiod:									
Total	491.67	48.08	394.12	442.20	9.78	80.16	89.94	49.47	5.70
Average	16.39	1.60	13.14	14.74	.....	.....	.....	1.65	.19
Entire preservative period:									
Total	1,450.73	134.44	1,182.38	1,316.82	9.27	81.50	90.77	133.91	14.70
Average	16.12	1.49	13.14	14.63	.....	.....	.....	1.49	.16
After period.									
First subperiod:									
Total	468.23	42.56	371.54	414.10	9.09	79.35	88.44	54.13	.0
Average	15.61	1.42	12.38	13.80	.....	.....	.....	1.81	.0
Second subperiod:									
Total	477.74	49.33	390.36	439.69	10.33	81.71	92.04	38.05	.0
Average	15.92	1.64	13.01	14.65	.....	.....	.....	1.27	.0
Entire after period:									
Total	945.97	91.89	761.90	853.79	9.71	80.54	90.26	92.18	.0
Average	15.77	1.53	12.70	14.23	.....	.....	.....	1.54	.0

TABLE X.—*Nitrogen balances for Series IX*—Continued.

SUMMARIES—Continued.

[Averages are per man per day.]

Nos. 7, 10, 11, and 12.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	341.21	33.16	299.64	332.80	9.72	87.82	97.54	8.41	0.0
Average	17.06	1.66	14.98	16.64	.....	.....	.....	.42	.0
Second subperiod:									
Total	344.29	35.01	283.19	318.20	10.17	82.25	92.42	26.09	.0
Average	17.21	1.75	14.16	15.91	.....	.....	.....	1.30	.0
Entire fore period:									
Total	685.50	68.17	582.83	651.00	9.94	85.02	94.97	34.50	.0
Average	17.14	1.70	14.57	16.28	.....	.....	.....	.86	.0
Preservative period.									
First subperiod:									
Total	342.07	34.49	282.38	316.87	10.08	82.55	92.63	25.20	2.00
Average	17.10	1.72	14.12	15.84	.....	.....	.....	1.26	.10
Second subperiod:									
Total	345.35	26.84	286.17	313.01	7.77	82.86	90.64	32.34	4.00
Average	17.27	1.34	14.31	15.65	.....	.....	.....	1.62	.20
Third subperiod:									
Total	335.35	28.73	276.49	305.22	8.57	82.45	91.02	30.13	3.70
Average	16.77	1.44	13.82	15.26	.....	.....	.....	1.51	.19
Entire preservative period:									
Total	1,022.77	90.06	845.04	935.10	8.81	82.62	91.43	87.67	9.70
Average	17.05	1.50	14.08	15.58	.....	.....	.....	1.47	.16
After period.									
First subperiod:									
Total	335.12	25.23	283.49	308.72	7.53	84.59	92.12	26.40	.0
Average	16.76	1.26	14.17	15.44	.....	.....	.....	1.32	.0
Second subperiod:									
Total	342.83	33.24	297.78	331.02	9.70	86.86	96.56	11.81	.0
Average	17.14	1.66	14.89	16.55	.....	.....	.....	.59	.0
Entire after period:									
Total	677.95	58.47	581.27	639.74	8.62	85.74	94.36	38.21	.0
Average	16.95	1.46	14.53	15.99	.....	.....	.....	.96	.0

TABLE X.—*Nitrogen balances for Series IX*—Continued.

SUMMARIES—Continued.

[Averages are per man per day.]

Nos. 1 to 12 (excluding Nos. 8 and 9).

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	819.95	79.56	693.65	773.21	9.70	84.60	94.30	46.74	0.0
Average	16.40	1.59	13.87	15.46				.94	.0
Second subperiod:									
Total	825.05	81.43	684.79	766.22	9.87	83.00	92.87	58.83	.0
Average	16.50	1.63	13.70	15.32				1.18	.0
Entire fore period:									
Total	1,645.00	160.99	1,378.44	1,539.43	9.79	83.80	93.58	105.57	.0
Average	16.45	1.61	13.78	15.39				1.06	.0
Preservative period.									
First subperiod:									
Total	819.27	79.35	673.16	752.51	9.69	82.17	91.85	66.76	5.00
Average	16.39	1.59	13.46	15.05				1.34	.10
Second subperiod:									
Total	827.21	68.34	683.65	751.99	8.26	82.65	90.91	75.22	10.00
Average	16.54	1.37	13.67	15.04				1.50	.20
Third subperiod:									
Total	827.02	76.81	670.61	747.42	9.29	81.09	90.38	79.60	9.40
Average	16.54	1.54	13.41	14.95				1.59	.19
Entire preservative period:									
Total	2,473.50	224.50	2,027.42	2,251.92	9.08	81.97	91.04	221.58	24.40
Average	16.49	1.50	13.52	15.01				1.48	.16
After period.									
First subperiod:									
Total	803.35	67.79	655.03	722.82	8.44	81.54	89.98	80.53	0
Average	16.07	1.36	13.10	14.46				1.61	.0
Second subperiod:									
Total	820.57	82.57	688.14	770.71	10.06	83.86	93.92	49.86	.0
Average	16.41	1.65	13.76	15.41				1.00	0
Entire after period:									
Total	1,623.92	150.36	1,343.17	1,493.53	9.26	82.71	91.97	130.39	0
Average	16.24	1.50	13.43	14.94				1.30	0

PHOSPHORIC-ACID BALANCE.

INDIVIDUAL DATA.

The phosphoric acid in the food of No. 1 was virtually constant throughout the three periods of observation, varying only slightly in the second decimal place, the smallest amount occurring in the preservative period. The quantity of phosphoric acid excreted in the feces was decreased by 0.062 gram in the preservative period and increased 0.168 gram in the after period. The quantity of phosphoric acid excreted in the urine is notably greater in the preservative period, namely, 0.302 gram daily, and suffers no further change in the after period. The total quantity of phosphoric acid excreted

in the feces and urine is increased in the preservative period by 0.24 gram, and further increased in the after period by 0.161 gram. Expressed in terms of phosphoric acid ingested, the largest percentage of phosphoric acid excreted in the feces is found in the after period and the smallest in the preservative period, when a decrease of 1.82 per cent is shown, the increase in the after period amounting to almost 5 per cent. A similar comparison for the metabolized phosphoric acid shows that the largest percentage was excreted in the preservative period (63.02) and the smallest in the fore period (53.24), the figure for the after period being decreased by about 1 per cent. The percentage data for total excretion show an increase of 8 per cent in the preservative period and a further increase of almost 4 per cent in the after period, more than 100 per cent of phosphoric acid appearing in the excreta. The balance, as would be expected, is positive in the fore and preservative periods, being, however, greatly decreased in the latter case (0.253 gram daily), and is negative in the after period. The general effect of the formaldehyde in this case appears to have been to increase the excretion of metabolized phosphoric acid eliminated in the urine, that is, to increase the katabolism of phosphoric acid, while less appears in the feces in the nonmetabolized form. This tendency is so marked as to cause an excretion of phosphoric acid in the after period exceeding the amount ingested in the food.

The phosphoric acid ingested in the case of No. 2 is practically constant throughout the three periods, being very slightly increased in the preservative and after periods, as compared with the fore period, the total variation being within 0.064 gram daily. The amount of phosphoric acid excreted in the feces is increased 0.116 gram daily in the preservative period, while in the after period it decreases almost to the figure of the fore period. The percentage increase amounts to over 2 per cent in the preservative period, with a corresponding decrease of practically the same amount in the after period. In the urine a larger quantity of phosphoric acid is excreted in both the preservative and after periods than in the fore period; the relative changes, compared with the amounts ingested, show the total increase to be less than 1 per cent, and therefore it is practically negligible. The total excretion in the feces and urine is greatest in the preservative period (increasing by 0.166 gram daily), and decreasing again very slightly in the after period. The percentage data show an increase of 2.65 per cent in the preservative period, exceeding by 1.42 per cent the total amount ingested, and in the after period a decrease of 2.11 per cent, almost returning to the figure for the fore period. The balance accordingly decreases in the preservative period, becoming negative, and increases in the after period. These data show, as did those for No. 1, a tendency on the

part of the formaldehyde to increase the excretion of the phosphoric acid constituents of the body, but in this case the increase is due mainly to nonmetabolized phosphoric acid.

The quantity of phosphoric acid ingested in the food of No. 3 is practically constant throughout all the stages of observation, namely, 4.3 grams daily. The amount excreted in the feces of No. 3 is very slightly decreased in the preservative period, but is increased 0.255 grams daily in the after period, exceeding the figure for the fore period. The quantity excreted in the urine is slightly greater in the preservative period than in the fore period (about 0.1 gram), and practically no further change takes place in the after period. The quantity of phosphoric acid excreted in the feces and urine increases from the beginning to the end of the experiment, the increase being more notable in the after period than in the preservative period, and amounting to 0.344 gram daily, as compared with the fore period. The percentage data show exactly the same relative changes, the most pronounced being the increase of 5 per cent in the nonmetabolized phosphoric acid in the after period, as compared with the fore period, and an increase in the preservative period of 2.47 per cent in metabolized phosphoric acid. The percentage data for total excretion show an increase of about 2 per cent in the preservative period and a further increase of nearly 5 per cent in the after period. The balance is strongly positive in the fore period, namely, 0.418 gram, but decreases in the preservative period to 0.341 gram, and in the after period to 0.089 gram. These data also indicate a tendency on the part of the preservative to increase the excretion of phosphoric material in the urine, and this tendency is continued to a greater extent during the after period.

The quantity of phosphoric acid ingested in the case of No. 4 is slightly greater in both the preservative and after periods than in the fore period, the increase amounting to 0.128 gram daily, comparing the fore and after periods. There is practically no change in the excretion of phosphoric acid in the feces in the preservative period, the relative increase being less than 1 per cent, but in the after period the increase of 0.32 gram daily represents a percentage increase of 7 per cent. The quantity of metabolized phosphoric acid excreted in the preservative period is 0.203 gram greater than in the fore period, a relative increase as compared with the amount ingested of 3.43 per cent, while in the after period the conditions of the fore period are almost restored. The total excretion in the feces and urine increases throughout, the figure for the after period exceeding that for the fore period by nearly 7 per cent. The balance is positive in all cases and quite large in the fore period (0.445 gram), decreasing almost one-half in the preservative period, and this number is again reduced almost by half in the after period. As in the

preceding cases, there is a tendency manifested on the part of the preservative to increase the excretion of phosphoric acid in the urine, the increased excretion in the after period being due to the nonmetabolized phosphoric acid.

The quantity of phosphoric acid ingested in the food in the case of No. 5 is practically constant throughout the three periods of observation. The amount appearing in the feces is diminished slightly in the preservative period and still further decreased in the after period, the percentage decrease in the preservative and after periods amounting to almost 1 and 1.7 per cent, respectively. The amount appearing in the urine is increased in the preservative period and still further increased in the after period; the relative increases as compared with the amounts ingested are 1.35 and 1.62 per cent, respectively. The total quantity excreted in the feces and urine is slightly increased in both the preservative and after periods, and in relation to the quantity of phosphoric acid ingested the percentages excreted in the preservative and after periods are practically the same (82.7), showing a very slight increase over the fore period of 0.5 per cent. The balance is strongly positive in all cases, abnormally so, but its magnitude is slightly decreased in the preservative and after periods as compared with the fore period, being smallest in the preservative period. In this case, there is a tendency on the part of the preservative to diminish the quantity of phosphoric acid excreted in the feces, and to increase the amount excreted in the urine, which is in harmony with the data for the preceding cases, but the tendency is less strongly marked in this case.

There is practically no difference in the quantity of phosphoric acid ingested in the case of No. 6, though there is a negligible increase throughout. There is a decrease of 0.374 gram daily in the quantity of phosphoric acid excreted in the feces in the preservative period and this decrease is only partially restored in the after period. On the contrary, there is a decided increase in the quantity of phosphoric acid excreted in the urine in the preservative period, amounting to 0.466 gram daily, and there is only a slight tendency to return to the conditions of the fore period in the after period. The total effect upon the excretion of phosphoric acid in the feces and urine is to increase very slightly in the preservative period, while in the after period it is almost the same as in the fore period. Expressed in terms of phosphoric acid ingested, there is a marked decrease of 10.73 per cent in the nonmetabolized phosphoric acid in the preservative period, with but a slight increase in the after period (about 1 per cent). In the urine the largest percentage excreted is found in the preservative period (67.15 per cent, or an increase of 13.03 per cent), while in the after period the percentage excreted is still very much greater than in the fore period (61.60 per cent, as compared with

54.12 per cent). The total excretion data show an increase of 2.31 per cent in the preservative period, and a decrease of 4.49 per cent in the after period. The balance is positive and of the greatest magnitude in the after period, and the smallest in the preservative period, the figures being 0.271, 0.190, and 0.354 for the three periods, respectively. In this case there is an evident tendency on the part of the preservative to diminish the quantity of phosphoric acid excreted in the feces, and to increase the quantity excreted in the urine, with the result that the balance decreases under the administration of the preservative. In other words, the katabolism of phosphoric acid in the tissues is increased.

In the case of No. 7 the quantity of phosphoric acid ingested varies only slightly in the three periods of observation, the increase occurring throughout amounting to only 0.046 gram per day in the after period, as compared with the fore period. There is a very notable decrease in the quantity of phosphoric acid excreted in the feces during the preservative period, amounting to 0.407 gram per day, with an additional decrease of 0.059 gram in the after period. There is also a progressive decrease in the quantity of phosphoric acid excreted in the urine in the preservative and after periods, the difference between the daily average for the fore and after periods being 0.358 gram, giving a decrease in total excretion of 0.824 gram.

Expressed in terms of phosphoric acid ingested, there is a decrease of almost 11 per cent in the nonmetabolized phosphoric acid excreted in the preservative period, and a further decrease of 1.72 per cent in the after period. The excretion of metabolized phosphoric acid also shows a marked decrease throughout, amounting to 10.04 per cent in the after period, as compared with the fore period. The percentage of total excretion in the fore period of 108.88 is seen to be abnormal, causing a negative balance of -0.338; in the preservative period there is a decrease of 16.57 per cent and a further decrease in the after period of 6.08 per cent, the balance increasing to 0.296 in the preservative period and 0.532 in the after period. The abnormal excretion in the fore period doubtless explains the variations in this case from the preceding cases producing an increase in the balance instead of a decrease in the preservative period.

The data for Nos. 8 and 9 are not discussed, for the reasons already stated.

In the case of No. 10 the quantity of phosphoric acid ingested varies somewhat in the three periods, being smallest in the preservative period and largest in the after period, the entire variation being within 0.265 gram. The diminution in the excretion of the feces in the preservative period is 0.144 gram, and the diminution in the quantity ingested is 0.119 gram. The increased excretion in the after period, however, is relatively greater than the increase in the

quantity of phosphoric acid ingested, namely, 0.335 gram as compared with 0.265 gram. There is also an increase in the excretion of phosphoric acid in the urine in the preservative period, and this is intensified in the after period, the difference between the daily average excretion in the fore and after periods being 0.301 gram. The total effect is to diminish slightly the quantity of phosphoric acid excreted in the preservative period and to increase it in the after period. Expressed in terms of phosphoric acid ingested, there is a decrease in nonmetabolized phosphoric acid excreted amounting to 2.53 per cent in the preservative period, and an increase of nearly 6 per cent in the after period. For the metabolized phosphoric acid there is an increase of about 4 per cent, and a further increase of less than 1 per cent in the preservative and after periods, respectively. The total percentage excretion in the preservative period is 101.05, a slight increase over the fore period, while in the after period the excretion is 7.52 per cent in excess of the amount ingested. The balance is slightly positive in the fore period, slightly negative in the preservative period, and strongly negative in the after period. The general tendency therefore is to increase the excretion of metabolized phosphoric acid during the administration of the preservative, and this tendency is continued in the after period, accompanied by a marked increase in the nonmetabolized phosphoric acid excreted.

There is no notable variation in the quantity of phosphoric acid ingested in the case of No. 11, though it is slightly greater (0.052 and 0.062 gram daily) in the preservative and after periods. There is a moderate diminution in the quantity of phosphoric acid excreted in the feces in the preservative period, amounting to 0.097 gram, and a slight increase in the quantity excreted in the after period, as compared with the fore period. There is a marked increase in the quantity of phosphoric acid excreted in the urine in the preservative period, amounting to 0.341 gram daily, and an additional increase of 0.078 gram in the after period. The total effect produced on the quantity of phosphoric acid excreted in the feces and urine is to increase it notably in both the preservative and after periods. Expressed in terms of phosphoric acid ingested, a decrease of 2.5 per cent in the excretion of nonmetabolized phosphoric acid is recorded in the preservative period, and a gain of 3.41 per cent in the after period. There is an increase of about 7 per cent in the metabolized phosphoric acid excreted in the preservative period, and a further increase of 1.61 per cent in the after period. The percentage data for the total excretion show an increase of 4.54 per cent in the preservative period, due entirely to metabolized phosphoric acid, and a further increase of 5 per cent in the after period, due to both forms. The balances are positive and abnormally large, diminishing, however, notably in the preservative and after periods.

The general effect here, as in all but one of the preceding cases, is to diminish slightly the phosphoric acid excretion in the feces and to increase its excretion greatly in the urine, the total effect being to break down the phosphoric acid material in the tissues more rapidly than it is rebuilt.

The quantity of phosphoric acid ingested in the food of No. 12 is almost the same in the three periods, the entire variation from the fore to the after period giving an average daily increase of 0.045 gram. There is very little difference in the quantity of phosphoric acid excreted in the feces in the fore and preservative periods, but the amount is considerably diminished in the after period. Expressed as percentage of the amounts ingested, there is a decrease in the nonmetabolized phosphoric acid excreted in the preservative period of 1.19, and a further decrease of 3.23 per cent in the after period. There is a very notable increase in the excretion of phosphoric acid in the urine in the preservative period, amounting to 0.492 gram, and this increase is maintained in the after period. Expressed in terms of the amounts ingested, there is seen to be an increased excretion of metabolized phosphoric acid amounting to 11.23 per cent in the preservative period, and practically the same percentage excretion is maintained in the after period. The total effect upon the excretion of phosphoric acid in the feces and urine is to increase it both in the preservative and after periods, as compared with the fore period, the percentage data showing an increase of about 10 per cent in the preservative period, and a decrease of only 3 per cent in the after period. The balance is strongly positive in the fore period, slightly positive in the preservative period, being decreased by 0.430 gram daily, and somewhat more strongly positive in the after period than in the preservative period. The general effect is to confirm the preceding results, which show that the quantity of phosphoric acid excreted in the feces is decreased, and the amount in the urine is increased in a much larger proportion, the total effect being to decrease the balance, owing to increased katabolism of phosphoric acid.

SUMMARIES.

The summary of the data for Nos. 1 to 6, inclusive, who received the formaldehyde immediately after it was added to the milk, shows a remarkably close agreement between the quantities of phosphoric acid ingested in the food in the three periods, the slight increase throughout being within 0.054 gram daily.

The average effect upon the quantity of phosphoric acid excreted in the feces is very slight, an increase having occurred in two cases and a decrease in four; the average figure for the six men showing a decrease of 0.056 gram daily in nonmetabolized phosphoric acid

excreted. In the after period the quantity excreted is slightly greater than in the fore period. The percentage data show that there is a decrease of 1.66 per cent in the phosphoric acid in the feces in the preservative period, followed by an increase of 2.51 per cent in the after period. The general effect, therefore, is a slight but well-defined tendency to diminish the quantity of nonmetabolized phosphoric acid in the feces.

In the case of the urine the data are very decisive. There is an increase in the quantity of metabolized phosphoric acid excreted in the preservative period in every case, and this increase is very large in most cases.

The figures for the after period show a continuation of the tendency induced by the formaldehyde. The actual increase in the quantity of phosphoric acid appearing in the preservative period is 0.196 gram, a percentage increase of 4.72 per cent, while in the after period the decrease of 0.034 gram represents a loss of only 1.37 per cent, based on the amount ingested. In the feces and urine there is noted a marked increase in the quantity of phosphoric acid excreted, and this increase is still further augmented in the after period, the percentage data for the three periods being 90.64, 93.70, and 94.84, respectively. The balances are positive in all cases, but diminish in magnitude throughout, showing a difference between the fore and after periods of 0.157 gram in the daily average per man.

These data are very decisive in showing a slight tendency on the part of the formaldehyde to diminish the quantity of phosphoric acid excreted in the feces and a marked tendency to increase the quantity excreted in the urine, the total effect being a progressive loss of phosphorus from the body, and the conditions induced by the preservative are, to a considerable extent, continued during the after period.

The summary of Nos. 7, 10, 11, and 12 shows the effect of the phosphoric acid administered after standing in contact with milk for forty-eight hours. The quantity of phosphoric acid ingested in the food in these cases is practically identical in the fore and preservative periods, and is slightly increased by only 0.082 gram daily in the after period. The quantity of phosphoric acid excreted in the feces is less in the preservative period by 0.174 gram daily and is increased 0.074 gram over the preservative period in the after period. Expressed in terms of the amounts ingested there is a decrease of 4.12 per cent in the nonmetabolized phosphoric acid excreted in the preservative period and an increase of only 1.20 per cent in the after period.

The quantity of phosphoric acid excreted in the urine is markedly greater in the preservative period, the increase amounting to 0.180 gram daily, and this increase is augmented by 0.041 gram daily in the

after period. This represents an increase of 4.42 per cent in the preservative period and practically no further change in the after period. The total effect is to increase the quantity of phosphoric acid excreted both in the preservative and after periods. The balances are positive and diminish regularly from the fore to the after period. These data confirm those secured in the summary for Nos. 1 to 6, inclusive, and show in a most unmistakable way the tendency of the formaldehyde to increase the excretion of the phosphatic materials in the form of metabolized phosphoric acid.

The summary for all of the subjects, excluding Nos. 8 and 9 because of incomplete data, shows that the amounts of phosphoric acid ingested are practically constant, the slight increase throughout amounting to only 0.062 gram from the fore to the after period. The decrease in the phosphoric acid excreted in the feces in the preservative period is 0.103 gram daily, while in the after period there is a tendency to return to the figures of the fore period. Expressed in terms of the amounts ingested, there is indicated a decrease of 2.69 per cent in the preservative period and an increase of 1.95 per cent in the after period. The metabolized phosphoric acid excreted in the urine increases 0.189 gram in the preservative period, an increase of 4.59 per cent, while in the after period the conditions of the preservative period are practically maintained. The data for total excretion show only a slight change in the preservative period, owing to the opposite effect produced on the metabolized and the nonmetabolized phosphoric acid, the increase of 0.086 gram in the preservative period and a further increase of practically the same amount in the after period representing a percentage increase of 1.90 and 1.05 per cent, respectively. The balance is correspondingly decreased throughout, the difference between the daily average for the fore and after periods being 0.113 gram.

The conclusion to be drawn in this case is clearly defined by the data. It is evident that the phosphoric acid excreted in the feces is slightly diminished under the influence of the formaldehyde, while that which is excreted in the urine is increased to a still greater extent, resulting in a decrease in the phosphoric acid balance of the body. While the variations in actual amounts are not very great, the effect of the preservative is unquestionable, inasmuch as the data for the ten men are uniform, with the exception of No. 7, in which case an abnormal condition existed in the fore period.

TABLE XI.—*Phosphoric-acid balances for Series IX.*

[Averages are per day.]

No. 1.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	15.666	4.824	7.447	12.271				3.395	0.0
Average	3.133	.965	1.489	2.454	30.79	47.54	78.33	.679	.0
Second subperiod:									
Total	15.999	6.655	9.412	16.067				−.068	.0
Average	3.200	1.331	1.882	3.213	41.60	58.83	100.43	−.013	.0
Entire fore period:									
Total	31.665	11.479	16.859	28.338				3.327	.0
Average	3.167	1.148	1.686	2.834	36.25	53.24	89.49	.333	.0
Preservative period.									
First subperiod:									
Total	16.004	5.727	10.005	15.732				.272	.50
Average	3.201	1.145	2.001	3.146	35.78	62.52	98.30	.055	.10
Second subperiod:									
Total	15.694	5.285	9.569	14.854				.840	1.00
Average	3.139	1.057	1.914	2.971	33.68	60.97	94.65	.168	.20
Third subperiod:									
Total	15.617	5.280	10.245	15.525				.092	1.00
Average	3.123	1.056	2.049	3.105	33.81	65.60	99.41	.018	.20
Entire preservative period:									
Total	47.315	16.292	29.819	46.111				1.204	2.50
Average	3.154	1.086	1.988	3.074	34.43	63.02	97.46	.080	.17
After period.									
First subperiod:									
Total	15.833	5.792	10.128	15.920				−.087	.0
Average	3.167	1.158	2.026	3.184	36.58	63.97	100.55	−.017	.0
Second subperiod:									
Total	16.059	6.747	9.679	16.426				−.367	.0
Average	3.212	1.349	1.936	3.285	42.01	60.27	102.29	−.073	.0
Entire after period:									
Total	31.892	12.539	19.807	32.346				−.454	.0
Average	3.189	1.254	1.981	3.235	39.32	62.11	101.42	−.046	.0

TABLE XI.—*Phosphoric-acid balances for Series IX*—Continued.

[Averages are per day.]

No. 2.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	20.607	6.366	12.740	19.106				1.501	0.0
Average	4.121	1.273	2.548	3.821	30.89	61.82	92.72	.300	.0
Second subperiod:									
Total	21.123	6.176	15.934	22.110				−.987	.0
Average	4.225	1.235	3.187	4.422	29.24	75.43	104.67	−.197	.0
Entire fore period:									
Total	41.730	12.542	28.674	41.216				.514	.0
Average	4.173	1.254	2.867	4.122	30.06	68.71	98.77	.051	.0
Preservative period.									
First subperiod:									
Total	21.316	6.857	14.308	21.165				.151	.50
Average	4.263	1.371	2.862	4.233	32.17	67.12	99.29	.030	.10
Second subperiod:									
Total	20.844	5.995	14.796	20.791				.053	1.00
Average	4.169	1.199	2.959	4.158	28.76	70.98	99.75	.011	.20
Third subperiod:									
Total	21.260	7.701	14.664	22.365				−1.105	1.00
Average	4.252	1.540	2.933	4.473	36.22	68.97	105.20	− .221	.20
Entire preservative period:									
Total	63.420	20.553	43.768	64.321				−.901	2.50
Average	4.228	1.370	2.918	4.288	32.41	69.01	101.42	−.060	.17
After period.									
First subperiod:									
Total	21.009	6.599	14.364	20.963				.046	.0
Average	4.202	1.320	2.873	4.193	31.41	68.37	99.78	.009	.0
Second subperiod:									
Total	21.358	6.060	15.052	21.112				.246	.0
Average	4.272	1.212	3.010	4.222	28.37	70.47	98.85	.050	.0
Entire after period:									
Total	42.367	12.659	29.416	42.075				.292	.0
Average	4.237	1.266	2.942	4.208	29.88	69.43	99.31	.029	.0

TABLE XI.—*Phosphoric-acid balances for Series IX*—Continued.

[Averages are per day.]

No. 3.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	21.649	6.531	11.581	18.112				3.537	0.0
Average	4.330	1.306	2.316	3.622	30.17	53.49	83.66	.708	.0
Second subperiod:									
Total	22.496	6.191	14.664	20.855				.641	.0
Average	4.299	1.238	2.933	4.171	28.80	68.22	97.02	.128	.0
Entire fore period:									
Total	43.145	12.722	26.245	38.967				4.178	.0
Average	4.315	1.272	2.625	3.897	29.49	60.83	90.32	.418	.0
Preservative period.									
First subperiod:									
Total	21.606	6.216	13.868	20.084				1.522	.50
Average	4.321	1.243	2.774	4.017	28.77	64.19	92.96	.304	.10
Second subperiod:									
Total	21.285	5.092	13.801	18.893				2.392	1.00
Average	4.257	1.018	2.760	3.779	23.92	64.84	88.76	.478	.20
Third subperiod:									
Total	21.644	7.261	13.180	20.441				1.203	1.00
Average	4.329	1.452	2.636	4.088	33.55	60.89	94.44	.241	.20
Entire preservative period:									
Total	64.535	18.569	40.849	59.418				5.117	2.50
Average	4.302	1.238	2.723	3.961	28.77	63.30	92.07	.341	.17
After period.									
First subperiod:									
Total	21.395	5.850	13.533	19.383				2.012	.0
Average	4.279	1.170	2.707	3.877	27.34	63.25	90.60	.402	.0
Second subperiod:									
Total	21.902	9.079	13.947	23.026				−1.124	.0
Average	4.380	1.816	2.789	4.605	41.45	63.68	105.13	− .225	.0
Entire after period:									
Total	43.297	14.929	27.480	42.409				.888	.0
Average	4.330	1.493	2.748	4.241	34.48	63.47	97.95	.089	.0

TABLE XI.—*Phosphoric-acid balances for Series IX*—Continued.

[Averages are per day.]

No. 4.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	20.540	5.658	10.708	16.366				4.174	0.0
Average	4.108	1.132	2.142	3.273	27.55	52.13	79.68	.835	.0
Second subperiod:									
Total	21.516	7.066	14.176	21.242				.274	.0
Average	4.303	1.413	2.835	4.248	32.84	65.89	98.73	.055	.0
Entire fore period:									
Total	42.056	12.724	24.884	37.608				4.448	.0
Average	4.206	1.272	2.488	3.761	30.25	59.17	89.42	.445	.0
Preservative period.									
First subperiod:									
Total	21.545	6.116	14.202	20.318				1.227	.50
Average	4.309	1.223	2.840	4.064	28.39	65.92	94.30	.245	.10
Second subperiod:									
Total	21.285	6.202	13.247	19.449				1.836	1.00
Average	4.257	1.240	2.649	3.890	29.14	62.24	91.37	.367	.20
Third subperiod:									
Total	21.649	7.440	12.916	20.356				1.293	1.00
Average	4.330	1.488	2.583	4.071	34.37	59.66	94.03	.259	.20
Entire preservative period:									
Total	64.479	19.758	40.365	60.123				4.356	2.50
Average	4.299	1.317	2.691	4.008	30.64	62.60	93.24	.291	.17
After period.									
First subperiod:									
Total	21.469	7.958	12.570	20.528				.941	.0
Average	4.294	1.592	2.514	4.106	37.07	58.55	95.62	.188	.0
Second subperiod:									
Total	21.868	8.410	12.831	21.241				.627	.0
Average	4.374	1.682	2.566	4.248	38.46	58.67	97.13	.126	.0
Entire after period:									
Total	43.337	16.368	25.401	41.769				1.568	.0
Average	4.334	1.637	2.540	4.177	37.77	58.61	96.38	.157	.0

TABLE XI.—*Phosphoric-acid balances for Series IX*—Continued.

[Averages are per day.]

No. 5.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1—4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	17.388	3.994	8.362	12.356				5.032	0.0
Average	3.478	.799	1.672	2.471	22.97	48.09	71.06	1.007	.0
Second subperiod:									
Total	17.741	3.898	12.626	16.524				1.217	.0
Average	3.548	.780	2.525	3.305	21.97	71.17	93.14	.243	.0
Entire fore period:									
Total	35.129	7.892	20.988	28.880				6.249	.0
Average	3.513	.789	2.099	2.888	22.47	59.75	82.21	.625	.0
Preservative period.									
First subperiod:									
Total	17.699	3.655	10.896	14.551				3.148	.50
Average	3.540	.731	2.179	2.910	20.65	61.56	82.21	.630	.10
Second subperiod:									
Total	17.438	3.818	10.945	14.763				2.675	1.00
Average	3.488	.764	2.189	2.953	21.89	62.77	84.66	.535	.20
Third subperiod:									
Total	17.711	3.938	10.447	14.385				3.326	1.00
Average	3.542	.788	2.089	2.877	22.23	58.99	81.22	.665	.20
Entire preservative period:									
Total	52.848	11.411	32.288	43.699				9.149	2.50
Average	3.523	.761	2.153	2.913	21.59	61.10	82.69	.610	.17
After period.									
First subperiod:									
Total	17.451	3.410	10.478	13.888				3.563	.0
Average	3.490	.682	2.096	2.778	19.54	60.04	79.58	.712	.0
Second subperiod:									
Total	17.961	3.648	11.734	15.382				2.579	.0
Average	3.592	.730	2.347	3.076	20.31	65.33	85.64	.516	.0
Entire after period:									
Total	35.412	7.058	22.212	29.270				6.142	.0
Average	3.541	.706	2.221	2.927	19.93	62.72	82.66	.614	.0

TABLE XI.—*Phosphoric-acid balances for Series IX*—Continued.

[Averages are per day.]

No. 6.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	17.361	6.122	9.109	15.231	.....	.....	.....	2.130	0.0
Average	3.472	1.224	1.822	3.046	35.26	52.47	87.73	.426	.0
Second subperiod:									
Total	17.835	7.322	9.938	17.260	.....	.....	.....	.575	.0
Average	3.567	1.464	1.988	3.452	41.05	55.72	96.78	.115	.0
Entire fore period:									
Total	35.196	13.444	19.047	32.491	.....	.....	.....	2.705	.0
Average	3.520	1.344	1.905	3.249	38.20	54.12	92.31	.271	.0
Preservative period.									
First subperiod:									
Total	17.848	4.290	12.785	17.075	.....	.....	.....	.773	.50
Average	3.570	.858	2.557	3.415	24.04	71.63	95.67	.155	.10
Second subperiod:									
Total	17.681	5.627	11.393	17.020	.....	.....	.....	.661	1.00
Average	3.536	1.125	2.279	3.404	31.83	64.44	96.26	.132	.20
Third subperiod:									
Total	17.439	4.631	11.390	16.021	.....	.....	.....	1.418	.70
Average	3.488	.926	2.278	3.204	26.56	65.31	91.87	.284	.14
Entire preservative period:									
Total	52.968	14.548	35.568	50.116	.....	.....	.....	2.852	2.20
Average	3.531	.970	2.371	3.341	27.47	67.15	94.62	.190	.15
After period.									
First subperiod:									
Total	17.587	5.051	10.977	16.028	.....	.....	.....	1.559	.0
Average	3.517	1.010	2.195	3.206	28.72	62.42	91.14	.311	.0
Second subperiod:									
Total	18.230	5.169	11.085	16.254	.....	.....	.....	1.976	.0
Average	3.446	1.034	2.217	3.251	28.35	60.81	89.16	.395	.0
Entire after period:									
Total	35.817	10.220	22.062	32.282	.....	.....	.....	3.535	.0
Average	3.582	1.022	2.206	3.228	28.53	61.60	90.13	.354	.0

TABLE XI.—*Phosphoric-acid balances for Series IX*—Continued.

[Averages are per day.]

No. 7.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	[a]18.910	8.736	[a]12.031	20.767				−1.857	0.0
Average	3.782	1.747	2.406	4.153	46.20	63.62	109.82	− .371	.0
Second subperiod:									
Total	19.237	8.736	12.031	20.767				−1.530	.0
Average	3.847	1.747	2.406	4.153	45.41	62.54	107.95	− .306	.0
Entire fore period:									
Total	38.147	17.472	24.062	41.534				−3.387	.0
Average	3.815	1.747	2.406	4.153	45.80	63.08	108.88	− .338	.0
Preservative period.									
First subperiod:									
Total	19.328	6.485	11.556	18.041				1.287	.50
Average	3.866	1.297	2.311	3.608	33.55	59.79	93.34	.258	.10
Second subperiod:									
Total	18.989	6.580	10.982	17.562				1.427	1.00
Average	3.798	1.316	2.196	3.512	34.65	57.83	92.49	.286	.20
Third subperiod:									
Total	19.262	7.038	10.509	17.547				1.715	1.00
Average	3.852	1.408	2.102	3.509	36.54	54.56	91.10	.343	.20
Entire preservative period:									
Total	57.579	20.103	33.047	53.150				4.429	2.50
Average	3.839	1.340	2.203	3.543	34.91	57.39	92.31	.296	.17
After period.									
First subperiod:									
Total	19.136	2.706	9.968	12.674				6.462	.0
Average	3.827	.541	1.994	2.535	14.14	52.09	66.23	1.292	.0
Second subperiod:									
Total	19.472	10.107	10.509	20.616				−1.144	.0
Average	3.894	2.021	2.102	4.123	51.91	53.97	105.88	− .229	.0
Entire after period:									
Total	38.608	12.813	20.477	33.290				5.318	.0
Average	3.861	1.281	2.048	3.329	33.19	53.04	86.23	.532	.0

[a] Average added to complete record.

TABLE XI.—*Phosphoric-acid balances for Series IX*—Continued.

[Averages are per day.]

No. 8.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	25.983	9.309	12.904	22.213				3.770	0.0
Average	5.197	1.862	2.581	4.443	35.83	49.66	85.49	.754	.0
Second subperiod:									
Total	26.580	9.656	15.744	25.400				1.180	.0
Average	5.316	1.931	3.149	5.080	36.33	59.23	95.56	.236	.0
Entire fore period:									
Total	52.563	18.965	28.648	47.613				4.950	.0
Average	5.256	1.897	2.865	4.761	36.08	54.50	90.58	.495	.0
Preservative period.									
First subperiod:									
Total	26.568	8.444	15.639	24.083				2.485	.50
Average	5.314	1.689	3.128	4.817	31.78	58.86	90.65	.497	10
Second subperiod:									
Total	26.263	8.456	16.546	25.002				1.261	1.00
Average	5.253	1.691	3.309	5.000	32.20	63.00	95.20	.253	.20
First and second subperiods:									
Total	52.831	16.900	32.185	49.085				3.746	1.50
Average	5.283	1.690	3.219	4.909	31.99	60.92	92.91	.374	.15

TABLE XI.—*Phosphoric-acid balances for Series IX*—Continued.

[Averages are per day.]

No. 10.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	20.398	5.979	12.468	18.447	.....	.....	.....	1.951	0.0
Average	4.080	1.196	2.494	3.689	29.31	61.12	90.44	.391	.0
Second subperiod:									
Total	21.278	8.544	14.473	23.017	.....	.....	.....	−1.739	.0
Average	4.256	1.709	2.895	4.603	40.15	68.02	108.17	− .347	.0
Entire fore period:									
Total	41.676	14.523	26.941	41.464	.....	.....	.....	.212	.0
Average	4.168	1.452	2.694	4.146	34.85	64.64	99.49	.022	.0
Preservative period.									
First subperiod:									
Total	21.613	7.247	14.835	22.082	.....	.....	.....	− .469	.50
Average	4.323	1.449	2.967	4.416	33.53	68.64	102.17	− .093	.10
Second subperiod:									
Total	21.148	6.273	14.480	20.753	.....	.....	.....	.395	1.00
Average	4.230	1.255	2.896	4.151	29.66	68.47	98.13	.079	.20
Third subperiod:									
Total	17.970	6.107	12.425	18.532	.....	.....	.....	− .562	.70
Average	3.594	1.221	2.485	3.706	33.98	69.14	103.13	− .112	.14
Entire preservative period:									
Total	60.731	19.627	41.740	61.367	.....	.....	.....	− .636	2.20
Average	4.049	1.308	2.783	4.091	32.32	68.73	101.05	− .042	.15
After period.									
First subperiod:									
Total	21.377	8.061	14.689	22.750	.....	.....	.....	−1.373	.0
Average	4.275	1.612	2.938	4.550	37.71	68.71	106.42	− .275	.0
Second subperiod:									
Total	21.759	8.372	15.259	23.631	.....	.....	.....	−1.872	.0
Average	4.352	1.674	3.052	4.726	38.48	70.13	108.60	− .374	.0
Entire after period:									
Total	43.136	16.433	29.948	46.381	.....	.....	.....	−3.245	.0
Average	4.314	1.643	2.995	4.638	38.10	69.43	107.52	− .324	.0

TABLE XI.—*Phosphoric-acid balances for Series IX*—Continued.

[Averages are per day.]

No. 11.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	21.684	6.242	11.008	17.250				4.434	0.0
Average	4.337	1.248	2.202	3.450	28.79	50.77	79.55	.887	.0
Second subperiod:									
Total	22.377	6.113	12.477	18.590				3.787	.0
Average	4.475	1.223	2.495	3.718	27.32	55.76	83.08	.757	.0
Entire fore period:									
Total	44.061	12.355	23.485	35.840				8.221	.0
Average	4.406	1.236	2.349	3.584	28.04	53.30	81.34	.822	.0
Preservative period.									
First subperiod:									
Total	22.482	4.674	13.432	18.106				4.376	.50
Average	4.496	.935	2.686	3.621	20.79	59.75	80.54	.875	.10
Second subperiod:									
Total	22.058	5.394	13.226	18.620				3.438	1.00
Average	4.412	1.079	2.645	3.724	24.45	59.96	84.41	.688	.20
Third subperiod:									
Total	22.337	7.014	13.695	20.709				1.628	1.00
Average	4.467	1.403	2.739	4.142	31.40	61.31	92.71	.325	.20
Entire preservative period:									
Total	66.877	17.082	40.353	57.435				9.442	2.50
Average	4.458	1.139	2.690	3.829	25.54	60.34	85.88	.629	.17
After period.									
First subperiod:									
Total	22.095	6.497	13.330	19.827				2.268	.0
Average	4.419	1.299	2.666	3.965	29.40	60.33	89.73	.454	.0
Second subperiod:									
Total	22.580	6.435	14.345	20.780				1.800	.0
Average	4.516	1.287	2.869	4.156	28.50	63.53	92.03	.360	.0
Entire after period:									
Total	44.675	12.932	27.675	40.607				4.068	.0
Average	4.468	1.293	2.768	4.061	28.95	61.95	90.89	.407	.0

TABLE XI.—*Phosphoric-acid balances for Series IX*—Continued.

[Averages are per day.]

No. 12.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	21.302	6.695	13.846	20.541				0.761	0.0
Average	4.260	1.339	2.769	4.108	31.43	65.00	96.42	.152	.0
Second subperiod:									
Total	21.537	4.378	12.459	16.837				1.700	.0
Average	4.307	.876	2.492	3.367	20.33	57.85	78.18	.940	.0
Entire fore period:									
Total	42.839	11.073	26.305	37.378				5.461	.0
Average	4.284	1.107	2.631	3.738	25.85	61.40	87.25	.546	.0
Preservative period.									
First subperiod:									
Total	21.621	6.465	16.335	22.800				−1.179	.50
Average	4.324	1.293	3.267	4.560	29.90	75.55	105.45	− .236	.10
Second subperiod:									
Total	21.243	4.263	15.428	19.691				1.552	1.00
Average	4.249	.853	3.086	3.938	20.07	72.63	92.69	.311	.20
Third subperiod:									
Total	21.627	5.177	15.080	20.257				1.370	1.00
Average	4.325	1.035	3.016	4.051	23.94	69.73	93.67	.274	.20
Entire preservative period:									
Total	64.491	15.905	46.843	62.748				1.743	2.50
Average	4.299	1.060	3.123	4.183	24.66	72.63	97.30	.116	.17
After period.									
First subperiod:									
Total	21.425	4.732	15.326	20.058				1.367	.0
Average	4.285	.946	3.065	4.012	22.09	71.53	93.62	.273	.0
Second subperiod:									
Total	21.862	4.546	16.212	20.758				1.104	.0
Average	4.372	.909	3.242	4.152	20.79	74.16	94.95	.220	.0
Entire after period:									
Total	43.287	9.278	31.538	40.816				2.471	.0
Average	4.329	.928	3.154	4.082	21.43	72.86	94.29	.247	.0

TABLE IX.—*Phosphoric-acid balances for Series IX*—Continued.

SUMMARIES.

[Averages are per man per day.]

Nos. 1 to 6.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	113.211	33.495	59.947	93.442	29.59	52.95	82.54	19.769	0.0
Average	3.774	1.116	1.998	3.115				.659	.0
Second subperiod:									
Total	115.710	37.308	76.750	114.058	32.24	66.33	98.57	1.652	.0
Average	3.857	1.244	2.558	3.802				.055	.0
Entire fore period:									
Total	228.921	70.803	136.697	207.500	30.93	59.71	90.64	21.421	.0
Average	3.815	1.180	2.278	3.458				.357	.0
Preservative period.									
First subperiod:									
Total	116.018	32.861	76.064	108.925	28.32	65.56	93.89	7.093	3.00
Average	3.867	1.095	2.535	3.631				.236	.10
Second subperiod:									
Total	114.227	32.019	73.751	105.770	28.03	64.57	92.60	8.457	6.00
Average	3.808	1.067	2.458	3.526				.282	.20
Third subperiod:									
Total	115.320	36.251	72.842	109.093	31.44	63.17	94.60	6.227	5.70
Average	3.844	1.208	2.428	3.636				.208	.19
Entire preservative period:									
Total	345.565	101.131	222.657	323.788	29.27	64.43	93.70	21.777	14.70
Average	3.840	1.124	2.474	3.598				.242	.16
After period.									
First subperiod:									
Total	114.744	34.660	72.050	106.710	30.21	62.79	93.00	8.034	.0
Average	3.825	1.155	2.402	3.557				.268	.0
Second subperiod:									
Total	117.378	39.113	74.328	113.441	33.32	63.32	96.65	3.937	.0
Average	3.913	1.304	2.478	3.781				.132	.0
Entire after period:									
Total	232.122	73.773	146.378	220.151	31.78	63.06	94.84	11.971	.0
Average	3.869	1.230	2.440	3.669				.200	.0

TABLE XI.—*Phosphoric-acid balances for Series IX*—Continued.

SUMMARIES—Continued.

[Averages are per man per day.]

Nos. 7, 10, 11, and 12.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	82.294	27.652	49.353	77.005	33.60	59.97	93.57	5.289	0.0
Average	4.115	1.383	2.468	3.850	.....	.....	.....	.265	.0
Second subperiod:									
Total	84.429	27.771	51.440	79.211	32.89	60.93	93.82	5.218	.0
Average	4.221	1.389	2.572	3.961	.....	.....	.....	.260	.0
Entire fore period:									
Total	166.723	55.423	100.793	156.216	33.24	60.46	93.70	10.507	.0
Average	4.168	1.386	2.520	3.905	.....	.....	.....	.263	.0
Preservative period.									
First subperiod:									
Total	85.044	24.871	56.158	81.029	29.24	66.03	95.28	4.015	2.00
Average	4.252	1.244	2.808	4.051	.....	.....	.....	.201	.10
Second subperiod:									
Total	83.438	22.510	54.116	76.626	26.98	64.86	91.84	6.812	4.00
Average	4.172	1.126	2.706	3.831	.....	.....	.....	.341	.20
Third subperiod:									
Total	81.196	25.336	51.709	77.045	31.20	63.68	94.89	4.151	3.70
Average	4.060	1.267	2.585	3.852	.....	.....	.....	.208	.19
Entire preservative period:									
Total	249.678	72.717	161.983	234.700	29.12	64.88	94.00	14.978	9.70
Average	4.161	1.212	2.700	3.912	.....	.....	.....	.249	.16
After period.									
First subperiod:									
Total	84.033	21.996	53.313	75.309	26.18	63.44	89.62	8.724	.0
Average	4.202	1.100	2.666	3.765	.....	.....	.....	.437	.0
Second subperiod:									
Total	85.673	29.460	56.325	85.785	34.39	65.74	100.13	−.112	.0
Average	4.284	1.473	2.816	4.289	.....	.....	.....	−.005	.0
Entire after period:									
Total	169.706	51.456	109.638	161.094	30.32	64.60	94.93	8.612	.0
Average	4.243	1.286	2.741	4.027	.....	.....	.....	.216	.0

TABLE XI.—*Phosphoric-acid balances for Series IX*—Continued.

SUMMARIES—Continued.

[Averages are per man per day.]

Nos. 1 to 12 (omitting Nos. 8 and 9).

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	195.505	61.147	109.300	170.447	31.28	55.91	87.18	25.058	0.0
Average	3.910	1.223	2.186	3.409	.....	.....	.....	.501	.0
Second subperiod:									
Total	200.139	65.079	128.190	193.269	32.52	64.05	96.57	6.870	.0
Average	4.003	1.302	2.564	3.865	.....	.....	.....	.138	.0
Entire fore period:									
Total	395.644	126.226	237.490	363.716	31.90	60.03	91.93	31.928	.0
Average	3.956	1.262	2.375	3.637	.....	.....	.....	.319	.0
Preservative period.									
First subperiod:									
Total	201.062	57.732	132.222	189.954	28.71	65.76	94.48	11.108	5.00
Average	4.021	1.155	2.644	3.799	.....	.....	.....	.222	.10
Second subperiod:									
Total	197.665	54.529	127.867	182.396	27.59	64.69	92.28	15.269	10.00
Average	3.953	1.091	2.557	3.648	.....	.....	.....	.305	.20
Third subperiod:									
Total	196.516	61.587	124.551	186.138	31.34	63.38	94.72	10.378	9.40
Average	3.930	1.232	2.491	3.723	.....	.....	.....	.207	.19
Entire preservative period:									
Total	595.243	173.848	384.640	558.488	29.21	64.62	93.83	36.755	24.40
Average	3.968	1.159	2.564	3.723	.....	.....	.....	.245	.16
After period.									
First subperiod:									
Total	198.777	56.656	125.363	182.019	28.50	63.07	91.57	16.758	.0
Average	3.976	1.133	2.507	3.640	.....	.....	.....	.336	.0
Second subperiod:									
Total	203.051	68.573	130.653	199.226	33.77	64.34	98.12	3.825	.0
Average	4.061	1.371	2.613	3.985	.....	.....	.....	.076	.0
Entire after period:									
Total	401.828	125.229	256.016	381.245	31.16	63.71	94.88	20.583	.0
Average	4.018	1.252	2.560	3.812	.....	.....	.....	.206	.0

SULPHUR BALANCE.

INDIVIDUAL DATA.

The quantity of sulphur administered in the food of No. 1 varies but slightly during the three periods, being a little larger in the preservative period (0.047 gram), and a little smaller in the after period than in the fore period. The quantity of sulphur excreted in the feces is decreased in the preservative period by 0.010 gram daily and is increased in the after period by 0.027 gram. The quantity of sulphur excreted in the urine is 0.047 gram greater in the preservative period and very slightly less in the after period than in the fore period. The total quantity of sulphur excreted in the feces and urine is increased 0.035 gram during the preservative period, and in the after period the daily average is almost the same as in the fore period. Expressed in

terms of sulphur ingested the largest percentage of sulphur excreted in the feces is in the after period (12.84 per cent) and the smallest in the preservative period (9.20 per cent), representing a decrease of 1.43 per cent. In the case of the urine the largest percentage is excreted in the after period and the smallest in the fore period, but the variations are very slight, the increase in the preservative period amounting to less than 1 per cent. There is practically no difference between the fore and preservative periods as to the per cent of total excretion, while in the after period an increase of 4.33 per cent is shown. The balance is positive in all cases and is largest in the preservative period, but this increase is not so great as the increase in the quantity ingested, as is shown by the percentage decrease in total excretion.

The general tendency in this case appears to be to diminish the quantity of sulphur excreted in the feces and to increase the quantity excreted in the urine, but the variations are very slight.

The sulphur in the food of No. 2 is 0.073 gram greater daily in the preservative period and 0.027 gram less in the after period than in the fore period. The quantity excreted in the feces, however, is 0.004 gram less in the preservative period than in the fore period and this amount is again diminished 0.016 gram in the after period. The excretion of sulphur in the urine is very slightly less in the preservative period than in the fore period, and slightly greater in the after period than in the fore period. The total effect on the excretion of sulphur in the feces and urine shows a diminution of 0.014 gram daily during the preservative period, although the amount of sulphur ingested is greater, while the amount in the after period is almost the same as in the fore period. Expressed in terms of sulphur ingested the largest percentage excreted in the feces is found in the fore period and the smallest in the after period, the difference between the two being 1.43 per cent. In respect of the urine, the largest percentage is found in the after period and the smallest in the preservative period, in which the decrease amounts to 5.40 per cent. The decrease in total excretion in the preservative period amounts to 6.44, with an increase of 9.04 per cent in the after period. The balance is positive in all cases and reaches its greatest magnitude in the preservative period. In this case the administration of the formaldehyde appears to have diminished the excretion of sulphur both in the feces and in the urine.

In the food of No. 3 there is 0.060 gram more sulphur found in the preservative period daily and 0.043 gram less in the after period than in the fore period. The quantity of sulphur excreted in the feces in the fore and preservative periods is almost the same, while in the after period it is increased 0.026 gram. The quantity of sulphur excreted in the urine is diminished 0.035 gram in the preservative period and increases again in the after period, but not to the magnitude of the fore period. The effect on the total excretion of sulphur

in the feces and urine is to diminish slightly the amount excreted in the preservative period and to increase very slightly the amount excreted in the after period over that of the fore period. In terms of sulphur ingested, the largest percentage excreted in the feces is in the after period (13.94 per cent) and the smallest in the preservative period, where a decrease of less than 1 per cent is recorded. In the case of the urine the same relative changes are shown, the decrease in the preservative period amounting to 6.20 per cent and the increase in the after period to 1.70 per cent, as compared with the fore period. The loss in total excretion amounts to almost 7 per cent in the preservative period, followed by an increase of 11.20 per cent in the after period. The balance is positive in all cases and its greatest magnitude is reached in the preservative period (0.233 gram), decreasing to 0.078 gram in the after period. These data also show a tendency on the part of formaldehyde to diminish the excretion of sulphur in both forms.

In the case of No. 4 there is a slightly larger quantity of sulphur in the food during the preservative period, exceeding the amount in the fore period by 0.077 gram daily. The quantity of sulphur excreted in the feces is only 0.027 gram greater in the preservative period, and further increases by 0.016 gram in the after period. The quantity excreted in the urine is increased 0.063 gram in the preservative period, but is slightly less in the after period than in the fore period. The total effect upon the quantity of sulphur excreted in the feces and urine is to increase it 0.090 gram daily in the preservative period, while in the after period the figure is 0.027 gram greater than in the fore period. These increases in the preservative period are very small, especially when the increase in the sulphur ingested is considered. The percentage data show an increase of 1.46 per cent excreted in the feces in the preservative period, and only 0.36 per cent increase in the urine, resulting in an increase of 1.82 per cent in total excretion. In the after period there is a further increase in the nonmetabolized sulphur excreted of 2.28 per cent, while the figure for metabolized sulphur is decreased 0.46 per cent, giving an increase in total excretion of 1.82. It will be noted that the percentage excretion of metabolized sulphur is practically constant. The balance is positive in all cases and decreases slightly throughout, varying from 0.178 in the fore period to 0.131 in the after period. These data are not in harmony with those of the preceding members of the class, but show on the contrary a very slight tendency on the part of the preservative to increase the excretion of sulphur, especially in nonmetabolized form.

The quantity of sulphur in the food in the case of No. 5 is 0.049 gram greater in the preservative period and 0.045 gram less in the after period than in the fore period. The quantity of sulphur

excreted in the feces is decreased 0.022 gram daily in the preservative period and is still further decreased by 0.007 gram in the after period. The quantity excreted in the urine is also decreased in the preservative period by 0.072 gram and is very slightly increased in the after period. The total effect, therefore, on the excretion of sulphur in both the feces and urine is to diminish the amount in the preservative period, while a slight tendency is shown to return to the figure of the fore period in the after period. In terms of the quantity of sulphur ingested, there is a decrease of 2.60 per cent in the nonmetabolized sulphur excreted in the preservative period and a decrease of 10.06 per cent in the metabolized sulphur, making a decrease in total excretion of 12.66 per cent. A tendency to return to the conditions of the fore period is shown throughout the after period. The balance is positive in all cases and greatly increased in the preservative period, while in the after period there is a decrease of 0.102 gram, as compared with the increase of 0.143 gram in the preservative period. These data show the same tendency as those for Nos. 2 and 3, namely, a decrease in the sulphur excreted both in the feces and urine under the influence of the formaldehyde and a partial return to normal conditions in the after period.

The sulphur ingested in the case of No 6 increases only slightly, 0.063 in the preservative period, with a decrease of 0.040 gram in the after period as compared with the fore period. The decrease in nonmetabolized sulphur excreted amounts to 0.029 gram in the preservative period and the decrease in metabolized sulphur to 0.035 gram, a loss in total excretion of 0.064 gram, while the amount ingested increased an equal amount. The percentage data show a decrease of 3.50 per cent in the sulphur in the feces and of 7.49 per cent in the urine, making a total decrease in sulphur excretion of 10.98 per cent. In the after period the tendency to decrease the excretion of sulphur is carried still further, as shown by the actual amounts, but the decrease in the quantity ingested results in a relative increase in the after period. The balance increases 0.127 gram daily in the preservative period, with a decrease of 0.040 gram in the after period. These data show the same tendency as in the majority of the preceding cases, namely, a decrease in both metabolized and nonmetabolized sulphur excreted, and an increase in the balance.

In the case of No. 7 again the quantity of sulphur in the food is slightly greater during the preservative period than in the fore period, the increase amounting to 0.072 gram daily, while in the after period the decrease amounts to 0.031 gram as compared with the fore period. The amount excreted in the feces decreases 0.050 gram daily in the preservative period and is still further decreased by 0.018 gram in the after period. A slight continuous decrease occurs in the quantity of sulphur excreted in the urine, the difference between

the average for the fore and after periods being 0.038 gram. The effect, therefore, upon the excretion of sulphur in the feces and urine is to diminish it very slightly, both in the preservative and after periods. In terms of sulphur ingested, the largest percentage excreted in the feces is in the fore period (15.20 per cent) and the smallest in the after period (9.66 per cent), a decrease of about 5 per cent occurring in the preservative period. In the case of the metabolized sulphur the largest percentage excreted is again found in the fore period and the smallest in the preservative period, a decrease of almost 6 per cent, followed by an increase of 4.83 per cent in the after period. The total excretion decreases 10.88 per cent in the preservative period and increases 4.19 per cent in the after period. The balance is positive in all cases, and very strongly so in the preservative period, when it increases 0.140 gram daily, the balance for the after period decreasing, but not to the figure for the fore period. In this case, as in all but two of the preceding cases, there is a tendency on the part of the formaldehyde to diminish the excretion of sulphur, both in the feces and in the urine. In the after period a partial return to the conditions of the fore period is shown.

The data for Nos. 8 and 9 are incomplete and are therefore of no practical value for purposes of comparison.

The quantity of sulphur in the food of No. 10 is practically the same during the three periods of the observation, decreasing 0.016 gram in the preservative period and increasing 0.008 in the after period. The quantity excreted in the feces is diminished 0.010 gram in the preservative period and increased 0.020 gram in the after period. There is also slightly less sulphur in the urine in the preservative and after periods than in the fore period. The total effect upon the sulphur excreted in the feces and urine is to diminish the amount very slightly in the preservative period, and this loss is partially recovered in the after period. The percentage data show a decrease of less than 1 per cent in the nonmetabolized sulphur excreted in the preservative period, a decrease of 2.19 per cent in metabolized sulphur, and a total decrease of 2.86 per cent. In the after period the excretion data are increased throughout. The balances in this case are abnormal, being all negative. The largest balance, however, occurs in the preservative period, and the same tendency to decrease the excretion of sulphur in the preservative period and return to the conditions of the fore period in the after period is shown, even under the abnormal conditions existing.

The quantity of sulphur in the food of No. 11 is increased in the preservative period by 0.076 gram and decreased in the after period by 0.031 gram, as compared with the fore period. There is a decrease in the quantity of sulphur excreted in the feces in the preservative

period of 0.017 gram and an increase of 0.021 gram in the after period. The quantity of sulphur excreted in the urine is very slightly increased in the preservative period and an additional increase takes place in the after period. The total effect, therefore, upon the excretion of sulphur in the feces and urine is to increase the quantity in the preservative period 0.020 gram and an additional 0.042 gram in the after period. In terms of the sulphur ingested the percentage decrease in nonmetabolized sulphur excreted in the preservative period is 1.87 per cent. In the urine the decrease in the preservative period amounts to 1.18 per cent, giving a total decreased excretion of 3.05 per cent. In the after period there is a strong tendency to increase the excretion in both forms, resulting in a total increase of 7.11 per cent as compared with the fore period. The balances are large and positive, the one of the greatest magnitude occurring in the preservative period. These data are not very marked, for while the percentage data and balance indicate, as previously, a decreased excretion of sulphur, there is a very slight increase in the absolute quantity of sulphur excreted.

In the case of No. 12, there is also a larger quantity of sulphur in the food during the preservative period (0.039 gram), and a smaller quantity in the after period (0.044 gram), than in the fore period. The quantity excreted in the feces is also greater in the preservative period by 0.018 gram, while there is a decrease of 0.053 gram in the after period. In the urine there is a very slight increase in the quantity of sulphur excreted in the preservative period, amounting to 0.019 gram, and a still greater increase in the after period. The effect in this case is to increase the total quantity of sulphur in the feces and urine in the preservative period by 0.037 gram daily, while in the after period this quantity is almost exactly the same as in the fore period. In terms of sulphur ingested, the largest percentage excreted in the feces is in the preservative period (14.88 per cent), the increase amounting to only about 1 per cent, and the smallest in the after period. In respect of the urine, the largest percentage excreted is in the after period (82.71 per cent), and the smallest in the preservative period, the decrease as compared with the fore period being less than 1 per cent. The total excretion, expressed in percentage, is practically unchanged in the preservative period and increases about 4 per cent in the after period, as compared with the fore period. The balances are all positive and those of the fore and preservative periods are almost the same, while that of the after period is notably diminished. The general effect here is to increase very slightly the quantity of sulphur excreted in the feces and urine together, and this increase is almost the same as the increase in the amount of sulphur in the food. As in the case of No. 11, the variations are too slight to warrant any definite conclusions being drawn from them.

SUMMARIES.

The summary for Nos. 1 to 6, inclusive, for the subjects who received formaldehyde in the freshly prepared state, shows that the quantity of sulphur administered in the food in the preservative period is 0.061 gram greater daily than in the fore period, while in the after period there is 0.037 gram less sulphur in the food, as compared with the fore period. The amount of sulphur excreted in the feces is diminished very slightly (0.007 gram) in the preservative period, although the amount ingested in the food is increased, and the figure for the after period is exactly that of the fore period. In the urine there is also a very slight diminution in the quantity of sulphur excreted in the preservative period, and a still further decrease in the after period. The total sulphur excreted in the feces and urine is diminished in the preservative period by 0.014 gram daily, and is still further diminished in the after period. In terms of sulphur content of the food, the largest percentage excreted in the feces is in the after period (12.70 per cent), and the smallest in the preservative period, where a loss of 1.20 per cent is shown. The largest percentage excreted in the urine is also found in the after period and the smallest in the preservative period, giving a decrease of 4.57 per cent. The percentages of total excretion show the same changes, the total loss in the preservative period amounting to 5.77 per cent. The balance is positive and increases 0.075 gram daily in the preservative period, decreasing in the after period to a slightly smaller figure than in the fore period. These data show that the general tendency of the formaldehyde is to diminish the quantity of sulphur excreted in the feces and also in the urine, and thus to increase the magnitude of the balance in the preservative period. While the variations are very slight, they are remarkably uniform, there being only one case, No. 4, which shows any marked variation from the general tendency. In only one other instance is there an increase in excretion (namely, metabolized sulphur in the case of No. 1), and the data obtained in the special studies on the urine bear out this point. There is also a uniform tendency (excepting No. 4), to return to the conditions of the fore period in the after period.

The summary for Nos. 7, 10, 11, and 12 shows the effect of formaldehyde which has stood in contact with milk for forty-eight hours. The quantity of sulphur in the food in this case is again slightly greater in the preservative period (an increase of 0.042 gram), and less in the after period than in the fore period by 0.029 gram daily. During the preservative period there appears in the feces 0.014 gram less sulphur daily, and this quantity is still further diminished in the after period. In the urine the quantity of sulphur excreted in the preservative period is almost exactly that of the fore period, while in the after period it is slightly greater. The total

effect upon the excretion of sulphur in both the feces and urine appears to be to decrease it very slightly in the preservative period (0.015 gram daily), and this loss is only partially regained in the after period. Expressed in terms of the amount of sulphur ingested, the largest percentage excreted in the feces is found in the fore period and the smallest in the preservative period, a decrease of 1.58, and this loss is maintained in the after period. In regard to the urine, the largest percentage of sulphur excreted occurs in the after period, and the smallest in the preservative period, a decrease of 2.73 per cent being shown. The data for total excretion show a decrease of 4.30 per cent in the preservative period, while in the after period the figure for the fore period is exceeded. The balance is positive in all cases and the figure for the preservative period is increased by 0.057 gram daily. While these data are not quite so decisive and uniform as those for Nos. 1 to 6, still the same general tendency is shown. The balance is uniformly increased; there is an increase in nonmetabolized sulphur excreted in only one case, and while the metabolized sulphur excreted shows very slight variation it is decreased (considering percentage data only) in all but one case. A tendency to reestablish in the after period the conditions of the fore period is again shown.

In the general summary for Nos. 1 to 12 (excluding Nos. 8 and 9 on account of incomplete data), the quantity of sulphur in the food is seen to be somewhat greater in the preservative period (0.054 gram daily) and slightly less in the after period (0.034 gram) than in the fore period. The quantity of sulphur excreted in the feces is less in the preservative period than in the fore period by 0.010 gram, and there is practically no further change in the after period. The quantity excreted in the urine is also very slightly decreased in the preservative period (0.005 gram daily), and there is still another slight decrease in the after period, amounting to 0.009 gram daily. The figures for total excretion show a decrease of 0.014 gram daily in the preservative period and a further decrease of 0.008 gram in the after period. In considering these figures it must be remembered that the sulphur ingested increased in the preservative period.

In terms of the sulphur ingested the loss in nonmetabolized sulphur excreted in the preservative period is 1.36 per cent, and in the case of metabolized sulphur the decrease amounts to 3.81 per cent, giving a total decrease in excretion of 5.17 per cent. In the after period the total increase amounts to 5.91 per cent, more than reestablishing the conditions of the fore period. The balance is positive in all cases and is increased in the preservative period by 0.068 gram daily. These data show that the general effect of the formaldehyde is to diminish the excretion of sulphur both in the feces and in the urine, and though the actual quantities by which the decreases

are measured are very small, the uniformity of the data, the confirmation of the tendency shown by the more detailed urine studies, and the accompanying increase in the sulphur ingested leave no doubt as to the fact that the preservative interferes decidedly with sulphur metabolism and tends to retain in the system quantities of sulphur which normally would be excreted.

TABLE XII.—*Sulphur balances for Series IX.*

[Averages are per day.]

No. 1.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	5.134	0.447	4.114	4.561				0.573	0.0
Average	1.027	.89	.823	.912	8.71	80.13	88.84	.115	.0
Second subperiod:									
Total	5.234	.655	4.090	4.745				.489	.0
Average	1.047	.131	.818	.949	12.51	78.14	90.66	.098	.0
Entire fore period:									
Total	10.368	1.102	8.204	9.306				1.062	.0
Average	1.037	.110	.820	.931	10.63	79.13	89.76	.106	.0
Preservative period.									
First subperiod:									
Total	5.543	.527	4.322	4.849				.694	.50
Average	1.109	.105	.864	.970	9.51	77.97	87.48	.139	.10
Second subperiod:									
Total	5.004	.484	4.423	4.907				.097	1.00
Average	1.001	.97	.885	.981	9.67	88.39	98.06	.020	.20
Third subperiod:									
Total	5.706	.484	4.253	4.737				.969	1.00
Average	1.141	.97	.851	.947	8.48	74.54	83.02	.194	.20
Entire preservative period:									
Total	16.253	1.495	12.998	14.493				1.760	2.50
Average	1.084	.100	.867	.966	9.20	79.97	89.17	.118	.17
After period.									
First subperiod:									
Total	4.941	.619	4.087	4.706				.235	.0
Average	.988	.124	.817	.941	12.53	82.72	95.24	.047	.0
Second subperiod:									
Total	4.927	.648	3.931	4.579				.348	.0
Average	.985	.130	.786	.916	13.15	79.78	92.94	.069	.0
Entire after period:									
Total	9.868	1.267	8.018	9.285				.583	.0
Average	.987	.127	.802	.929	12.84	81.25	94.09	.058	.0

TABLE XII.—*Sulphur balances for Series IX*—Continued.

[Averages are per day.]

No. 2.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	6.021	0.812	5.095	5.907				0.114	0.0
Average	1.204	.162	1.019	1.181	13.49	84.62	98.11	.023	.0
Second subperiod:									
Total	6.125	.761	4.908	5.669				.456	.0
Average	1.225	.152	.982	1.134	12.42	80.13	92.56	.091	.0
Entire fore period:									
Total	12.146	1.573	10.003	11.576				.570	.0
Average	1.215	.157	1.000	1.158	12.95	82.36	95.31	.057	.0
Preservative period.									
First subperiod:									
Total	6.589	.794	4.630	5.424				1.165	.50
Average	1.318	.159	.926	1.085	12.05	70.27	82.32	.233	.10
Second subperiod:									
Total	5.920	.611	5.170	5.781				.139	1.00
Average	1.184	.122	1.034	1.156	10.32	87.33	97.65	.028	.20
Third subperiod:									
Total	6.806	.896	5.065	5.961				.845	1.00
Average	1.361	.179	1.013	1.192	13.16	74.42	87.58	.169	.20
Entire preservative period:									
Total	19.315	2.301	14.865	17.166				2.149	2.50
Average	1.288	.153	.991	1.144	11.91	76.96	88.87	.144	.17
After period.									
First subperiod:									
Total	5.928	.743	5.107	5.850				.078	.0
Average	1.186	.149	1.021	1.170	12.53	86.15	98.68	.016	.0
Second subperiod:									
Total	5.948	.625	5.153	5.778				.170	.0
Average	1.190	.125	1.031	1.156	10.51	86.63	97.14	.034	.0
Entire after period:									
Total	11.876	1.368	10.260	11.628				.248	.0
Average	1.188	.137	1.026	1.163	11.52	86.39	97.91	.025	.0

TABLE XII.—*Sulphur balances for Series IX*—Continued.

[Averages are per day.]

No. 3.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First superiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	6.292	0.785	4.807	5.592				0.700	0.0
Average	1.258	.157	.961	1.118	12.48	76.40	88.87	.140	.0
Second subperiod:									
Total	6.256	.643	4.964	5.607				.649	0
Average	1.251	.129	.993	1.121	10.28	79.35	89.63	.130	.0
Entire fore period:									
Total	12.548	1.428	9.771	11.199				1.349	.0
Average	1.255	.143	.977	1.120	11.38	77.87	89.25	.135	.0
Preservative period.									
First subperiod:									
Total	6.696	.746	4.777	5.523				1.173	.50
Average	1.339	.149	.955	1.105	11.14	71.34	82.48	.234	10
Second subperiod:									
Total	6.021	.514	4.844	5.358				.663	1.00
Average	1.204	.103	.969	1.072	8.54	80.45	88.99	.132	.20
Third subperiod:									
Total	7.003	.837	4.513	5.350				1.653	1.00
Average	1.401	.167	.903	1.070	11.95	64.44	76.40	.331	.20
Entire preservative period:									
Total	19.720	2.097	14.134	16.231				3.489	2.50
Average	1.315	.140	.942	1.082	10.63	71.67	82.31	.233	.17
After period.									
First subperiod:									
Total	6.035	.669	4.933	5.602				.433	.0
Average	1.207	.134	.987	1.120	11.09	81.74	92.83	.087	.0
Second subperiod:									
Total	6.087	1.021	4.712	5.733				.354	.0
Average	1.217	.204	.942	1.147	16.77	77.41	94.18	.070	.0
Entire after period:									
Total	12.122	1.690	9.645	11.335				.787	.0
Average	1.212	.169	.965	1.134	13.94	79.57	93.51	.078	.0

TABLE XII.—*Sulphur balances for Series IX*—Continued.

[Averages are per day.]

No. 4.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	6.081	0.496	4.367	4.863				1.218	0.0
Average	1.216	.99	.873	.973	8.16	71.81	79.97	.243	.0
Second subperiod:									
Total	6.269	.773	4.933	5.706				.563	.0
Average	1.254	.155	.987	1.141	12.33	78.69	91.02	.113	.0
Entire fore period:									
Total	12.350	1.269	9.300	10.569				1.781	.0
Average	1.235	.127	.930	1.057	10.28	75.30	85.58	.178	.0
Preservative period.									
First subperiod:									
Total	6.657	.764	5.097	5.861				.796	.50
Average	1.331	.153	1.019	1.172	11.48	76.57	88.04	.159	.10
Second subperiod:									
Total	6.021	.668	4.852	5.520				.501	1.00
Average	1.204	.134	.970	1.104	11.09	80.58	91.68	.100	.20
Third subperiod:									
Total	7.005	.878	4.944	5.822				1.183	1.00
Average	1.401	.176	.989	1.164	12.53	70.58	83.11	.237	.20
Entire preservative period:									
Total	19.683	2.310	14.893	17.203				2.480	2.50
Average	1.312	.154	.993	1.147	11.74	75.66	87.40	.165	.17
After period.									
First subperiod:									
Total	6.084	.783	4.680	5.463				.621	.0
Average	1.217	.157	.936	1.093	12.87	76.92	89.79	.124	.0
Second subperiod:									
Total	6.068	.921	4.458	5.379				.689	.0
Average	1.214	.184	.892	1.076	15.18	73.47	88.65	.138	.0
Entire after period:									
Total	12.152	1.704	9.138	10.842				1.310	.0
Average	1.215	.170	.914	1.084	14.02	75.20	89.22	.131	.0

TABLE XII.—*Sulphur balances for Series IX*—Continued.

[Averages are per day.]

No. 5.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	5.217	0.767	3.863	4.630				0.587	0.0
Average	1.043	.153	.773	.926	14.70	74.05	88.75	.117	.0
Second subperiod:									
Total	5.245	.554	4.306	4.860				.385	.0
Average	1.049	.111	.861	.972	10.56	82.10	92.66	.077	.0
Entire fore period:									
Total	10.462	1.321	8.169	9.490				.972	.0
Average	1.046	.132	.817	.949	12.63	78.08	90.71	.097	.0
Preservative period.									
First subperiod:									
Total	5.552	.555	3.686	4.241				1.311	.50
Average	1.110	.111	.737	.848	10.00	66.39	76.39	.262	.10
Second subperiod:									
Total	5.008	.525	3.781	4.306				702	1.00
Average	1.002	.105	.756	.861	10.48	75.50	85.98	.141	.20
Third subperiod:									
Total	5.863	.567	3.704	4.271				1.592	1.00
Average	1.173	.113	.741	.854	9.67	63.18	72.85	.319	.20
Entire preservative period:									
Total	16.423	1.647	11.171	12.818				3.605	2.50
Average	1.095	.110	.745	.855	10.03	68.02	78.05	.240	.17
After period.									
First subperiod:									
Total	4.979	.508	3.464	3.972				1.007	.0
Average	.996	.102	.693	.794	10.20	69.57	79.78	.202	.0
Second subperiod:									
Total	5.035	.524	4.131	4.655				.380	.0
Average	1.007	.105	.826	.931	10.41	82.05	92.45	.076	.0
Entire after period:									
Total	10.014	1.032	7.595	8.627				1.387	.0
Average	1.001	.103	.760	.863	10.31	75.84	86.15	.138	.0

TABLE XII.—*Sulphur balances for Series IX*—Continued.

[Averages are per day.]

No. 6.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	5.291	0.806	3.810	4.616	.....	.....	.....	0.675	0.0
Average	1.058	.161	.762	.923	15.23	72.01	87.24	.135	.0
Second subperiod:									
Total	5.297	.894	4.383	5.277	.....	.....	.....	.020	.0
Average	1.059	.179	.877	1.055	16.88	82.74	99.62	.004	.0
Entire fore period:									
Total	10.588	1.700	8.193	9.893	.....	.....	.....	.695	.0
Average	1.059	.170	.819	.989	16.06	77.38	93.44	.070	.0
Preservative period.									
First subperiod:									
Total	5.707	.624	4.041	4.665	.....	.....	.....	1.042	.50
Average	1.141	.125	.808	.933	10.93	70.81	81.74	.208	.10
Second subperiod:									
Total	5.134	.729	3.834	4.563	.....	.....	.....	.571	1.00
Average	1.027	.146	.767	.913	14.20	74.68	88.88	.114	.20
Third subperiod:									
Total	5.985	.761	3.885	4.646	.....	.....	.....	1.339	.70
Average	1.197	.152	.777	.929	12.72	64.91	77.63	.268	.14
Entire preservative period:									
Total	16.826	2.114	11.760	13.874	.....	.....	.....	2.952	2.20
Average	1.122	.141	.784	.925	12.56	69.89	82.46	.197	.15
After period.									
First subperiod:									
Total	5.078	.641	3.546	4.187	.....	.....	.....	.891	.0
Average	1.016	.128	.709	.837	12.62	69.83	82.45	.179	.0
Second subperiod:									
Total	5.114	.706	3.726	4.432	.....	.....	.....	.682	.0
Average	1.023	.141	.745	.886	13.81	72.86	86.66	.137	.0
Entire after period:									
Total	10.192	1.347	7.272	8.619	.....	.....	.....	1.573	.0
Average	1.019	.135	.727	.862	13.22	71.35	84.57	.157	.0

TABLE XII.—*Sulphur balances for Series IX*—Continued.

[Averages are per day.]

No. 7.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	[a] 5.804	0.892	[a] 4.608	5.500	.....	.....	.....	0.304	0.0
Average	1.161	.178	.922	1.100	15.37	79.39	94.76	.061	.0
Second subperiod:									
Total	5.935	.892	4.608	5.500	.....	.....	.....	.435	.0
Average	1.187	.178	.922	1.100	15.03	77.64	92.67	.087	.0
Entire fore period:									
Total	11.739	1.784	9.216	11.000	.....	.....	.....	.739	.0
Average	1.174	.178	.922	1.100	15.20	78.51	93.70	.074	.0
Preservative period.									
First subperiod:									
Total	6.362	.656	4.621	5.277	.....	.....	.....	1.085	.50
Average	1.272	.131	.924	1.055	10.31	72.63	82.95	.217	.10
Second subperiod:									
Total	5.721	.609	4.560	5.169	.....	.....	.....	.552	1.00
Average	1.144	.122	.912	1.034	10.64	79.71	90.35	.110	.20
Third subperiod:									
Total	6.609	.661	4.374	5.035	.....	.....	.....	1.574	1.00
Average	1.322	.132	.875	1.007	10.00	66.18	76.18	.315	.20
Entire preservative period:									
Total	18.692	1.926	13.555	15.481	.....	.....	.....	3.211	2.50
Average	1.246	.128	.904	1.032	10.30	72.52	82.82	.214	.17
After period.									
First subperiod:									
Total	5.721	.242	4.244	4.486	.....	.....	.....	1.235	.0
Average	1.144	.048	.849	.897	4.23	74.18	78.41	.247	.0
Second subperiod:									
Total	5.711	.862	4.599	5.461	.....	.....	.....	.250	.0
Average	1.142	.172	.920	1.092	15.09	80.53	95.62	.050	.0
Entire after period:									
Total	11.432	1.104	8.843	9.947	.....	.....	.....	1.485	.0
Average	1.143	.110	.884	.995	9.66	77.35	87.01	.148	.0

[a] Average added to complete record.

TABLE XII.—*Sulphur balances for Series IX*—Continued.

[Averages are per day.]

No. 8.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	7.098	0.778	5.560	6.338	.....	.....	.....	0.760	0.0
Average	1.420	.156	1.112	1.268	10.96	78.33	89.29	.152	.0
Second subperiod:									
Total	7.184	.758	5.526	6.284	.....	.....	.....	.900	.0
Average	1.437	.152	1.105	1.257	10.55	76.92	87.47	.180	.0
Entire fore period:									
Total	14.282	1.536	11.086	12.622	.....	.....	.....	1.660	.0
Average	1.428	.154	1.109	1.262	10.75	77.62	88.38	.166	.0
Preservative period.									
First subperiod:									
Total	7.629	.769	5.481	6.250	.....	.....	.....	1.379	.50
Average	1.526	.154	1.096	1.250	10.08	71.84	81.92	.276	.10
Second subperiod:									
Total	6.916	.731	5.641	6.372	.....	.....	.....	.544	1.00
Average	1.383	.146	1.128	1.274	10.57	81.56	92.13	.109	.20
First and second subperiods:									
Total	14.545	1.500	11.122	12.622	.....	.....	.....	1.923	1.50
Average	1.455	.150	1.112	1.262	10.31	76.47	86.78	.193	.15

TABLE XII.—*Sulphur balances for Series IX*—Continued.

[Averages are per day.]

No. 10.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	5.995	0.533	5.668	6.201				−0.206	0.0
Average	1.199	.107	1.134	1.240	8.89	94.55	103.44	− .041	.0
Second subperiod:									
Total	6.141	.813	5.507	6.320				− .179	.0
Average	1.228	.163	1.101	1.264	13.24	89.68	102.91	− .036	.0
Entire fore period:									
Total	12.136	1.346	11.175	12.521				− .385	.0
Average	1.214	.135	1.118	1.252	11.09	92.08	103.17	− .038	.0
Preservative period.									
First subperiod:									
Total	6.627	.812	5.585	6.397				.230	.50
Average	1.325	.162	1.117	1.279	12.25	84.28	96.53	.046	.10
Second subperiod:									
Total	5.935	.536	5.493	6.029				− .094	1.00
Average	1.187	.107	1.099	1.206	9.03	92.55	101.58	− .019	.20
Third subperiod:									
Total	5.409	.524	5.076	5.600				− .191	.70
Average	1.082	.105	1.015	1.120	9.69	93.84	103.53	− .038	.14
Entire preservative period:									
Total	17.971	1.872	16.154	18.026				− .055	2.20
Average	1.198	.125	1.077	1.202	10.42	89.89	100.31	− .004	.15
After period.									
First subperiod:									
Total	6.036	.690	5.496	6.186				− .150	.0
Average	1.207	.138	1.099	1.237	11.43	91.05	102.49	− .030	.0
Second subperiod:									
Total	6.023	.759	5.397	6.156				− .133	.0
Average	1.205	.152	1.079	1.231	12.60	89.61	102.21	− .026	.0
Entire after period:									
Total	12.059	1.449	10.893	12.342				− .283	.0
Average	1.206	.145	1.089	1.234	12.02	90.33	102.35	− .028	.0

TABLE XII.—*Sulphur balances for Series IX*—Continued.

[Averages are per day.]

No. 11.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	6.210	0.647	4.328	4.975	.....	.....	.....	1.235	0.0
Average	1.242	.129	.866	.995	10.42	69.69	80.11	.247	.0
Second subperiod:									
Total	6.388	.634	4.586	5.220	.....	.....	.....	1.168	.0
Average	1.278	.127	.917	1.044	9.92	71.79	81.72	.234	.0
Entire fore period:									
Total	12.598	1.281	8.914	10.195	.....	.....	.....	2.403	.0
Average	1.260	.128	.891	1.020	10.17	70.76	80.93	.240	.0
Preservative period.									
First subperiod:									
Total	6.809	.533	4.508	5.041	.....	.....	.....	1.768	.50
Average	1.362	.107	.902	1.008	7.83	66.21	74.03	.354	.10
Second subperiod:									
Total	6.149	.494	4.834	5.328	.....	.....	.....	.821	1.00
Average	1.230	.99	.967	1.066	8.03	78.61	86.65	.164	.20
Third subperiod:									
Total	7.076	.636	4.598	5.234	.....	.....	.....	1.842	1.00
Average	1.415	.127	.920	1.047	8.99	64.98	73.97	.368	.20
Entire preservative period:									
Total	20.034	1.663	13.940	15.603	.....	.....	.....	4.431	2.50
Average	1.336	.111	.929	1.040	8.30	69.58	77.88	.296	.17
After period.									
First subperiod:									
Total	6.117	.645	4.839	5.484	.....	.....	.....	.633	.0
Average	1.223	.129	.968	1.097	10.54	79.11	89.65	.126	.0
Second subperiod:									
Total	6.170	.677	4.657	5.334	.....	.....	.....	.836	.0
Average	1.234	.135	.931	1.067	10.97	75.48	86.45	.167	.0
Entire after period:									
Total	12.287	1.322	9.496	10.818	.....	.....	.....	1.469	.0
Average	1.229	.132	.950	1.082	10.76	77.28	88.04	.147	.0

TABLE XII.—*Sulphur balances for Series IX*—Continued.

[Averages are per day.]

No. 12.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	6.243	0.893	5.083	5.976				0.267	0.0
Average	1.249	.179	1.017	1.195	14.30	81.42	95.72	054	.0
Second subperiod:									
Total	6 224	.835	4.439	5.274				.950	.0
Average	1.245	.167	.888	1.055	13.42	71.32	84.74	.190	.0
Entire fore period:									
Total	12.467	1.728	9.522	11.250				1.217	.0
Average	1.247	.173	.952	1.125	13.86	76.38	90.24	.122	.0
Preservative period.									
First subperiod:									
Total	6.560	1.254	4.881	6.135				.425	.50
Average	1.312	.251	.976	1.227	19.12	74.41	93.52	.085	.10
Second subperiod:									
Total	5.937	.837	4.606	5.443				.494	1.00
Average	1.187	167	.921	1.089	14.10	77.58	91.68	.098	.20
Third subperiod:									
Total	6.791	.779	5.077	5.856				.935	1.00
Average	1.358	.156	1.015	1.171	11.47	74.76	86.23	.187	.20
Entire preservative period:									
Total	19.288	2.870	14.564	17.434				1.854	2.50
Average	1.286	.191	.971	1.162	14.88	75.51	90.39	.124	.17
After period.									
First subperiod:									
Total	5.999	.724	4.995	5.719				.280	.0
Average	1.200	.145	.999	1.144	12.07	83.26	95.33	.056	.0
Second subperiod:									
Total	6 032	.652	4.956	5.608				.424	.0
Average	1.206	.130	.991	1.122	10.81	82.16	92.97	.084	.0
Entire after period:									
Total	12.031	1.376	9.951	11 327				.704	.0
Average	1.203	.138	.995	1.133	11.44	82.71	94.15	.070	.0

TABLE XII.—*Sulphur balances for Series IX*—Continued.

SUMMARIES.

[Averages are per man per day.]

Nos. 1 to 6.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	34.036	4.113	26.056	30.169	12.08	76.55	88.64	3.867	0.0
Average	1.135	.137	.869	1.006	.....	.....	.....	.129	.0
Second subperiod:									
Total	34.426	4.280	27.584	31.864	12.43	80.13	92.56	2.562	.0
Average	1.148	.143	.919	1.062	.....	.....	.....	.086	.0
Entire fore period:									
Total	68.462	8.393	53.640	62.033	12.26	78.35	90.61	6.429	.0
Average	1.141	.140	.894	1.034	.....	.....	.....	.107	.0
Preservative period.									
First subperiod:									
Total	36.714	4.010	26.553	30.563	10.92	72.32	83.25	6.151	3.00
Average	1.224	.134	.885	1.019	.....	.....	.....	.205	.10
Second subperiod:									
Total	33.108	3.531	26.904	30.435	10.67	81.26	91.93	2.673	6.00
Average	1.104	.118	.897	1.014	.....	.....	.....	.090	.20
Third subperiod:									
Total	38.368	4.423	26.364	30.787	11.53	68.71	80.24	7.581	5.70
Average	1.279	.147	.879	1.026	.....	.....	.....	.253	.19
Entire preservative period:									
Total	108.190	11.964	79.821	91.785	11.06	73.78	84.84	16.405	14.70
Average	1.202	.133	.887	1.020	.....	.....	.....	.182	.16
fter period.									
First subperiod:									
Total	33.045	3.963	25.817	29.780	11.99	78.13	90.12	3.265	.0
Average	1.102	.132	.861	.993	.....	.....	.....	.100	.0
Second subperiod:									
Total	33.179	4.445	26.111	30.556	13.40	78.70	92.09	2.623	.0
Average	1.106	.148	.870	1.019	.....	.....	.....	.087	.0
Entire after period:									
Total	66.224	8.408	1.928	60.336	12.70	78.41	91.11	5.888	.0
Average	1.104	.140	.865	1.006	.....	.....	.....	.098	.0

TABLE XII.—*Sulphur balances for Series IX*—Continued.

SUMMARIES—Continued.

[Averages are per man per day.]

Nos. 7, 10, 11, and 12.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	24.252	2.965	19.687	22.652	12.23	81.18	93.40	1.600	0.0
Average	1.213	.148	.984	1.132	.....	.....	.....	.081	.0
Second subperiod:									
Total	24.688	3.174	19.140	22.314	12.86	77.53	90.38	2.374	.0
Average	1.234	.159	.957	1.116	.....	.....	.....	.118	.0
Entire fore period:									
Total	48.940	6.139	38.827	44.966	12.54	79.34	91.88	3.974	.0
Average	1.224	.153	.971	1.124	.....	.....	.....	.100	.0
Preservative period.									
First subperiod:									
Total	26.358	3.255	19.595	22.850	12.35	74.34	86.69	3.508	2.00
Average	1.318	.163	.980	1.143	.....	.....	.....	.175	.10
Second subperiod:									
Total	23.742	2.476	19.493	21.969	10.43	82.10	92.53	1.773	4.00
Average	1.187	.124	.975	1.099	.....	.....	.....	.088	.20
Third subperiod:									
Total	25.885	2.600	19.125	21.725	10.04	73.88	83.93	4.160	3.70
Average	1.294	.130	.956	1.086	.....	.....	.....	.208	.19
Entire preservative period:									
Total	75.985	8.331	58.213	66.544	10.96	76.61	87.58	9.441	9.70
Average	1.266	.139	.970	1.109	.....	.....	.....	.157	.16
After period.									
First subperiod:									
Total	23.873	2.301	19.574	21.875	9.64	81.99	91.63	1.998	.0
Average	1.194	.115	.979	1.094	.....	.....	.....	.100	.0
Second subperiod:									
Total	23.936	2.950	19.609	22.559	12.32	81.92	94.25	1.377	.0
Average	1.197	.148	.980	1.128	.....	.....	.....	.069	.0
Entire after period:									
Total	47.809	5.251	39.183	44.434	10.98	81.96	92.94	3.375	.0
Average	1.195	.131	.980	1.111	.....	.....	.....	.084	.0

TABLE XII.—*Sulphur balances for Series IX*—Continued.

SUMMARIES—Continued.

[Averages are per man per day.]

Nos. 1 to 12 (excluding Nos. 8 and 9).

Period.	1 In food.	2 In feces	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1—4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	58.288	7.078	45.743	52.821	12.14	78.48	90.62	5.467	0.0
Average	1.166	.142	.915	1.056				.110	.0
Second subperiod:									
Total	59.114	7.454	46.724	54.178	12.61	79.04	91.65	4.936	.0
Average	1.182	.149	.934	1.084				.098	.0
Entire fore period:									
Total	117.402	14.532	92.467	106.999	12.38	78.76	91.14	10.403	.0
Average	1.174	.145	.925	1.070				.104	.0
Preservative period.									
First subperiod:									
Total	63.072	7.265	46.148	53.413	11.52	73.17	84.69	9.659	5.00
Average	1.261	.145	.923	1.068				.193	.10
Second subperiod:									
Total	56.850	6.007	46.397	52.404	10.57	81.61	92.18	4.446	10.00
Average	1.137	.120	.928	1.048				.089	.20
Third subperiod:									
Total	64.253	7.023	45.489	52.512	10.93	70.80	81.73	11.741	9.40
Average	1.285	.140	.910	1.050				.235	.19
Entire preservative period:									
Total	184.175	20.295	138.034	158.329	11.02	74.95	85.97	25.846	24.40
Average	1.228	.135	.920	1.056				.172	.16
After period.									
First subperiod:									
Total	56.918	6.264	45.391	51.655	11.01	79.75	90.75	5.263	.0
Average	1.138	.125	.908	1.033				.105	.0
Second subperiod:									
Total	57.115	7.395	45.720	53.115	12.95	80.05	93.00	4.000	.0
Average	1.142	.148	.914	1.062				.080	.0
Entire after period:									
Total	114.033	13.659	91.111	104.770	11.98	79.90	91.88	9.263	.0
Average	1.140	.137	.911	1.048				.092	.0

FAT BALANCE.

INDIVIDUAL DATA.

The quantity of fat administered in the food in the case of No. 1 is quite constant, increasing only 0.38 gram daily in the preservative period, and being practically identical in the fore and after periods. The quantity of fat eliminated in the feces is very slightly decreased in the preservative period and is increased in the after period by 0.62 gram over the fore period. The entire variation, however, is within 1 per cent. In this case, the administration of the formaldehyde appears to favor, to a very slight extent, the absorption of fats in the digestive canal.

The fats ingested in the case of No. 2 are considerably greater in the preservative period than in the fore period, increasing 2.20 grams

per day and decreasing slightly in the after period. Notwithstanding this increase, the excretion of fat in the feces is markedly less in the preservative period (1.06 grams daily), and is again decreased slightly in the after period. The percentage decrease amounts to almost 3 per cent, comparing the fore and after periods. The balance is consequently larger in the preservative and after periods than in the fore period. In this case also the administration of the formaldehyde appears to increase the absorption of the fat from the alimentary canal.

The fat in the food of No. 3 is also notably greater in the preservative period, the increase amounting to 2.36 grams daily, and in the after period the conditions of the fore period are practically reestablished. The quantity of fat excreted in the feces is again slightly less in the preservative period, although the ingestion is increased, but is greater in the after period than in the fore period. The balance is consequently larger in the preservative period than in either of the others, exceeding that of the fore period by 2.72 grams daily, although the percentage decrease in excretion is very small, less than half of 1 per cent. In this case also the administration of the preservative appears to increase the absorption of the fat from the alimentary canal.

The quantity of fat in the food in the case of No. 4 is also greater in the preservative period, the increase amounting to 2.79 grams daily, and decreases only slightly in the after period, not regaining the figure of the fore period. The quantity of fat excreted in the feces is very slightly increased in the preservative period (0.27 gram), and though this increase does not equal that in the quantity of fat ingested, there is a further increase in the fat of the feces in the after period. The balance is again largest in the preservative period, exceeding that of the fore period by 2.52 grams daily, due in this case to an increase in ingestion, since there is a slight tendency to decrease the absorption of the fat in the intestinal canal, as shown by the excretion data.

In the case of No. 5 there is little difference in the quantity of fat in the food in the three periods, the increase in the preservative period amounting to only 0.42 gram daily, and the decrease in the after period to 0.83 gram, as compared with the fore period. There is a diminution in the quantity of fat excreted in the feces in the preservative period amounting to 0.18 gram, and an increase in the after period over the fore period of 0.11 gram daily. The percentage decrease in the preservative period is very small, as is also the increase in the balance in the preservative period. These data also show a very slight tendency on the part of the preservative to decrease the excretion of the fat in the preservative period, although the amount ingested is increased.

In the case of No. 6 there is very little difference in the quantity of fat ingested in the three periods, the increase in the preservative period amounting to 0.70 gram, and the decrease in the after period to 1.18 grams. There is an enormous decrease in the quantity excreted in the feces during the preservative period amounting to 2.14 grams daily, or 2.35 per cent, and this is only partially restored in the after period, when a gain of 0.91 gram is shown. The balance is decidedly larger in the preservative period than in either of the other periods. These data agree with the preceding cases, excepting No. 4, in showing a tendency on the part of the preservative to increase the absorption of fat in the intestinal canal.

In the case of No. 7 the quantity of fat ingested in the food is slightly greater in the preservative period (an increase of 1.12 grams) and decreases again 0.54 gram in the after period. There is a diminution in the amount of fat in the feces in the preservative period of 0.33 gram daily, and a still further decrease in the after period of 0.32 gram. The percentage decrease is slight, less than 1 per cent, but is continued in the after period. The balance is again increased in the preservative period, showing the same tendency as the preceding cases to increase slightly the absorption of fat from the intestinal canal.

In the case of Nos. 8 and 9 the data are too fragmentary to be of any value for comparison.

In the case of No. 10 the quantity of fat ingested is decreased 4.46 grams daily in the preservative period and is increased 2.58 grams in the after period, as compared with the fore period. The quantity of fat excreted in the feces is slightly decreased in the preservative period, the percentage decrease amounting to only 0.21 per cent, while the increase in the after period is only 0.35 per cent. These variations are negligible, the decrease in the balance in the preservative period of 4 grams being largely due to decreased ingestion. These data are, however, contrary in their tendency to those of the preceding cases and indicate that in this case the preservative slightly diminished the absorption of the fat.

In the case of No. 11 there is an increase in the quantity of fat in the food during the preservative period, amounting to 4.59 grams daily, and 2.45 grams in the after period, as compared with the fore period. The quantity of fat excreted in the feces is very slightly increased in the preservative period, but not to the extent of the increase of fat in the ration, with the result that the percentage figure is decreased. There is a still further increase in the excretion of fat in the after period, while the amount ingested decreases. The balance in the preservative period is larger than in the fore or after period, but the large increase in ingestion and slight variations in excretion data make it impracticable to draw any positive conclusions

in this case, though the tendency to increase the absorption of fat in the alimentary canal in the preservative period is indicated.

There is a larger quantity of fat in the food of No. 12 in both the preservative and after periods than in the fore period, the increase being slightly more than 2 grams daily. There is a slightly increased excretion in the preservative period (0.51 gram daily) and also in the after period (0.22 gram) over the fore period, but considering the increased amount of fat in the ration the percentage increase is only 0.38. The balance in this case is largest in the after period, but is larger in the preservative period than in the fore period. This, however, is due to the increase in ingestion, since there is a slightly increased excretion both in percentage and quantity and no tendency of the preservative to increase the absorption of fat can be established.

SUMMARIES.

The summary for Nos. 1 to 6, inclusive, who received formaldehyde recently mixed with milk, shows an increase in the quantity of fat in the food during the preservative period amounting to 1.47 grams daily and of 0.30 gram in the after period, as compared with the fore period. There is a marked decrease in the amount of fat excreted in the feces in the preservative period of 0.6 gram daily, although the amount ingested is larger, giving a percentage decrease of 0.7 per cent. This decrease is almost restored in the after period, when the excretion is practically the same as in the fore period. The balance in the preservative period is 2.07 grams greater than in the fore period. These data indicate a distinct effect on the part of the formaldehyde to increase the absorption of the fat from the food during its passage through the alimentary canal.

The summary for Nos. 7, 10, 11, and 12 represents the effect in the case of those who received the formaldehyde after it had been mixed with the milk for forty-eight hours. In this summary it is seen that the quantity of fat ingested is increased only 0.87 gram daily in the preservative period and again increased 2.02 grams daily in the after period as compared with the fore period. The quantity of fat excreted is very slightly decreased in the preservative period (0.05 gram daily) and is somewhat greater in the after period than in the fore period. In relation to the fat ingested the percentage excreted in the feces is only 0.08 per cent less in the preservative period. The balance is largest in the after period, but is slightly greater in the preservative period than in the fore period. These data also indicate a tendency on the part of the formaldehyde to promote the absorption of the fat during its passage through the alimentary canal, but this tendency is not nearly so marked as in the summary for Nos. 1 to 6, inclusive.

The general summary shows the total effect produced upon the ten men, excluding Nos. 8 and 9, in regard to the metabolism of fat. This summary shows an increase in the quantity of fat in the ration during the preservative period of 1.23 grams daily, and this increase is practically maintained in the after period. There is a decrease in the amount of fat excreted in the feces during the preservative period of 0.39 gram daily, while the amount in the after period is almost exactly that of the fore period. Considering the amount of fat in the food the smallest percentage is excreted in the feces during the preservative period (a decrease of 0.43 per cent), the percentage excreted during the fore and after periods being almost identical. The balance is consequently largest in the preservative period. The summarized data, therefore, indicate that the formaldehyde increased slightly the absorption of fat from the alimentary canal, and the result was more marked in the case of those who received the formaldehyde freshly added to the milk.

TABLE XIII.—*Fat balances for Series IX.*

[Averages are per day.]

No. 1.

Period.	1 In food.	2 In feces.	3 In feces (2÷1).	4 Balance (1−2).	5 Formaldehyde administered.
Fore period.					
First subperiod:	*Grams.*	*Grams.*	*Per cent.*	*Grams.*	*Grams*
Total	427.50	10.95	.....	416.55	0.0
Average	85.50	2.19	2.56	83.31	.0
Second subperiod:					
Total	463.27	11.17	.....	452.10	.0
Average	92.65	2.23	2.41	90.42	.0
Entire fore period:					
Total	890.77	22.12	.....	868.65	.0
Average	89.08	2.21	2.48	86.87	.0
Preservative period.					
First subperiod:					
Total	450.40	11.37	.....	439.03	.50
Average	90.08	2.27	2.52	87.81	.10
Second subperiod:					
Total	447.52	10.35	.....	437.17	1.00
Average	89.50	2.07	2.31	87.43	.20
Third subperiod:					
Total	444.04	8.88	.....	435.16	1.00
Average	88.81	1.78	2.00	87.03	.20
First, second, and third subperiods:					
Total	1,341.96	30.60	.....	1,311.36	2.50
Average	89.46	2.04	2.28	87.42	.17
After period.					
First subperiod:					
Total	457.19	14.70	.....	442.49	.0
Average	91.44	2.94	3.22	88.50	.0
Second subperiod.					
Total	433.51	13.58	.....	419.93	.0
Average	86.70	2.72	3.13	83.98	.0
Entire after period:					
Total	890.70	28.28	.....	862.42	.0
Average	89.07	2.83	3.18	86.24	.0

TABLE XIII.—*Fat balances for Series IX*—Continued.

[Averages are per day.]

No. 2.

Period.	1 In food.	2 In feces.	3 In feces (2÷1).	4 Balance (1−2).	5 Formaldehyde administered.
Fore period.					
First subperiod:	*Grams.*	*Grams.*	*Per cent.*	*Grams.*	*Grams.*
Total	450.10	38.08	.....	412.02	0.0
Average	90.02	7.62	8.46	82.40	.0
Second subperiod:					
Total	493.52	28.92	.....	464.60	.0
Average	98.70	5.78	5.86	92.92	.0
Entire fore period:					
Total	943.62	67.00	.....	876.62	.0
Average	94.36	6.70	7.10	87.66	.0
Preservative period.					
First subperiod:					
Total	482.42	28.95	.....	453.47	.50
Average	96.48	5.79	6.00	90.69	.10
Second subperiod:					
Total	474.56	24.02	.....	450.54	1.00
Average	94.91	4.80	5.06	90.11	.20
Third subperiod:					
Total	491.40	31.58	.....	459.82	1.00
Average	98.28	6.32	6.43	91.96	.20
First, second, and third subperiods:					
Total	1,448.38	84.55	.....	1,363.83	2.50
Average	96.56	5.64	5.84	90.92	.17
After period.					
First subperiod:					
Total	489.40	29.26	.....	460.14	.0
Average	97.88	5.85	5.98	92.03	.0
Second subperiod:					
Total	462.46	21.26	.....	441.20	.0
Average	92.49	4.25	4.60	88.24	.0
Entire after period:					
Total	951.86	50.52	.....	901.34	.0
Average	95.19	5.05	5.31	90.14	.0

TABLE XIII.—*Fat balances for Series IX*—Continued.

[Averages are per day.]

No. 3.

Period.	1 In food.	2 In feces.	3 In feces (2÷1).	4 Balance (1−2).	5 Formaldehyde administered.
Fore period.					
First subperiod:	*Grams.*	*Grams.*	*Per cent.*	*Grams.*	*Grams.*
Total	506.95	16.08	.....	490.87	0.0
Average	101.39	3.22	3.17	98.17	.0
Second subperiod:					
Total	553.14	10.79	.....	542.35	.0
Average	110.63	2.16	1.95	108.47	.0
Entire fore period:					
Total	1,060.09	26.87	.....	1,033.22	.0
Average	106.01	2.69	2.53	103.32	.0
Preservative period.					
First subperiod:					
Total	542.47	11.37	.....	531.10	.50
Average	108.49	2.27	2.10	106.22	.10
Second subperiod:					
Total	532.70	9.44	.....	523.26	1.00
Average	106.54	1.89	1.77	104.65	.20
Third subperiod:					
Total	550.41	14.19	.....	536.22	1.00
Average	110.08	2.84	2.58	107.24	.20
First, second, and third subperiods:					
Total	1,625.58	35.00	.....	1,590.58	2.50
Average	108.37	2.33	2.15	106.04	.17
After period.					
First subperiod:					
Total	544.54	13.15	.....	531.39	.0
Average	108.91	2.63	2.41	106.28	.0
Second subperiod:					
Total	522.71	25.68	.....	497.03	.0
Average	104.54	5.14	4.91	99.40	.0
Entire after period:					
Total	1,067.25	38.83	.....	1,028.42	.0
Average	106.73	3.88	3.64	102.85	.0

TABLE XIII.—*Fat balances for Series IX*—Continued.

[Averages are per day.]

No. 4.

Period.	1 In food.	2 In feces.	3 In feces (2÷1).	4 Balance (1−2).	5 Formaldehyde administered.
Fore period.					
First subperiod:	*Grams.*	*Grams.*	*Per cent.*	*Grams.*	*Grams.*
Total	440.08	19.60	.....	420.48	0.0
Average	88.02	3.92	4.45	84.10	.0
Second subperiod:					
Total	493.83	22.58	.....	471.25	0
Average	98.77	4.52	4.57	94.25	.0
Entire fore period.					
Total	933.91	42.18	.....	891.73	.0
Average	93.39	4.22	4.52	89.17	.0
Preservative period.					
First subperiod:					
Total	480.19	18.23	.....	461.96	.50
Average	96.04	3.65	3.80	92.39	.10
Second subperiod:					
Total	472.80	21.76	.....	451.04	1.00
Average	94.56	4.35	4.60	90.21	.20
Third subperiod:					
Total	489.78	27.38	.....	462.40	1.00
Average	97.96	5.48	5.59	92.48	.20
First, second, and third subperiods:					
Total	1,442.77	67.37	.....	1,375.40	2.50
Average	96.18	4.49	4.67	91.69	.17
After period.					
First subperiod:					
Total	488.13	25.82	.....	462.31	.0
Average	97.63	5.16	5.29	92.47	.0
Second subperiod:					
Total	461.67	21.61	.....	440.06	.0
Average	92.33	4.32	4.68	88.01	.0
Entire after period.					
Total	949.80	47.43	.....	902.37	.0
Average	94.98	4.74	4.99	90.24	.0

TABLE XIII.—*Fat balances for Series IX*—Continued.

[Averages are per day.]

No. 5.

Period.	1 In food.	2 In feces.	3 In feces (2÷1).	4 Balance (1−2).	5 Formaldehyde administered.
Fore period.					
First subperiod:	*Grams.*	*Grams.*	*Per cent.*	*Grams.*	*Grams.*
Total	393.64	14.33	.....	379.31	0.0
Average	78.73	2.87	3.64	75.86	.0
Second subperiod:					
Total	433.81	11.69	.....	422.12	.0
Average	86.76	2.34	2.69	84.42	.0
Entire fore period:					
Total	827.45	26.02	.....	801.43	.0
Average	82.75	2.60	3.14	80.15	.0
Preservative period.					
First subperiod:					
Total	409.40	12.26	.....	397.14	.50
Average	81.88	2.45	2.99	79.43	.10
Second subperiod:					
Total	412.64	11.35	.....	401.29	1.00
Average	82.53	2.27	2.75	80.26	.20
Third subperiod:					
Total	425.52	12.70	.....	412.82	1.00
Average	85.10	2.54	2.98	82.56	.20
First, second, and third subperiods:					
Total	1,247.56	36.31	.....	1,211.25	2.50
Average	83.17	2.42	2.91	80.75	.17
After period.					
First subperiod:					
Total	416.77	14.29	.....	402.48	.0
Average	83.35	2.86	3.43	80.49	.0
Second subperiod:					
Total	402.42	12.77	.....	389.65	.0
Average	80.48	2.55	3.17	77.93	.0
Entire after period:					
Total	819.19	27.06	.....	792.13	.0
Average	81.92	2.71	3.30	79.21	.0

TABLE XIII.—*Fat balances for Series IX*—Continued.

[Averages are per day.]

No. 6.

Period.	1 In food.	2 In feces.	3 In feces (2÷1).	4 Balance (1−2).	5 Formaldehyde administered.
Fore period.					
First subperiod:	*Grams.*	*Grams.*	*Per cent.*	*Grams.*	*Grams.*
Total	441.65	18.47	.....	423.18	0.0
Average	88.33	3.69	4.18	84.64	.0
Second subperiod:					
Total	472.63	22.39	.....	450.24	.0
Average	94.53	4.48	4.74	90.05	.0
Entire fore period:					
Total	914.28	40.86	.....	873.42	.0
Average	91.43	4.09	4.47	87.34	.0
Preservative period.					
First subperiod:					
Total	457.77	8.58	.....	449.19	.50
Average	91.55	1.72	1.87	89.83	.10
Second subperiod:					
Total	455.49	10.40	.....	445.09	1.00
Average	91.10	2.08	2.28	89.02	.20
Third subperiod:					
Total	468.75	10.31	.....	458.44	.70
Average	93.75	2.06	2.20	91.69	.14
First, second, and third subperiods:					
Total	1,382.01	29.29	.....	1,352.72	2.20
Average	92.13	1.95	2.12	90.18	.15
After period.					
First subperiod:					
Total	458.35	14.28	.....	444.07	.0
Average	91.67	2.86	3.12	88.81	.0
Second subperiod:					
Total	451.16	14.31	.....	436.85	.0
Average	90.23	2.86	3.17	87.37	.0
Entire after period:					
Total	909.51	28.59	.....	880.92	.0
Average	90.95	2.86	3.14	88.09	.0

TABLE XIII.—*Fat balances for Series IX*—Continued.

[Averages are per day.]

No. 7.

Period.	1 In food.	2 In feces.	3 In feces (2÷1).	4 Balance (1−2).	5 Formaldehyde administered.
Fore period.					
First subperiod:	*Grams.*	*Grams.*	*Per cent.*	*Grams.*	*Grams.*
Total	[a] 413.21	13.89	.....	399.32	0.0
Average	82.64	2.78	3.36	79.86	.0
Second subperiod:					
Total	451.09	13.89	.....	437.20	.0
Average	90.22	2.78	3.08	87.44	.0
Entire fore period:					
Total	864.30	27.78	.....	836.52	.0
Average	86.43	2.78	3.21	83.65	.0
Preservative period.					
First subperiod:					
Total	441.49	11.24	.....	430.25	.50
Average	88.30	2.25	2.55	86.05	.10
Second subperiod:					
Total	430.27	10.10	.....	420.17	1.00
Average	86.05	2.02	2.35	84.03	.20
Third subperiod:					
Total	441.55	15.48	.....	426.07	1.00
Average	88.31	3.10	3.51	85.21	.20
First, second, and third subperiods:					
Total	1,313.31	36.82	.....	1,276.49	2.50
Average	87.55	2.45	2.80	85.10	.17
After period.					
First subperiod:					
Total	447.96	4.83	.....	443.13	.0
Average	89.59	.97	1.08	88.62	.0
Second subperiod:					
Total	422.17	16.43	.....	405.74	.0
Average	84.43	3.29	3.89	81.14	.0
Entire after period:					
Total	870.13	21.26	.....	848.87	.0
Average	87.01	2.13	2.44	84.88	.0

[a] Average for one day added to complete record.

TABLE XIII.—*Fat balances for Series IX*—Continued.

[Averages are per day.]

No. 8.

Period.	1 In food.	2 In feces.	3 In feces (2÷1).	4 Balance (1−2).	5 Formaldehyde administered.
Fore period.					
First subperiod:	*Grams.*	*Grams.*	*Per cent.*	*Grams.*	*Grams.*
Total	629.23	20.75	.....	608.48	0.0
Average	125.85	4.15	3.30	121.70	.0
Second subperiod:					
Total	703.58	21.39	.....	682.19	.0
Average	140.72	4.28	3.04	136.44	.0
Entire fore period:					
Total	1,332.81	42.14	.....	1,290.67	.0
Average	133.28	4.21	3.16	129.07	.0
Preservative period.					
First subperiod:					
Total	690.22	17.56	.....	672.66	.50
Average	138.04	3.51	2.54	134.53	.10
Second subperiod:					
Total	676.87	17.49	.....	659.38	1.00
Average	115.37	3.50	2.58	131.87	.20
First and second subperiods:					
Total	1,367.09	35.05	.....	1,332.04	1.50
Average	136.71	3.51	2.56	133.20	.15

TABLE XIII.—*Fat balances for Series IX*—Continued.

[Averages are per day.]

No. 10.

Period.	1 In food.	2 In feces.	3 In feces (2÷1).	4 Balance (1−2).	5 Formaldehyde administered.
Fore period.					
First subperiod:	*Grams.*	*Grams.*	*Per cent.*	*Grams.*	*Grams.*
Total	553.01	25.21	.....	527.80	0.0
Average	110.60	5.04	4.56	105.56	.0
Second subperiod:					
Total	615.59	31.99	.....	583.60	.0
Average	123.12	6.40	5.20	116.72	.0
Entire fore period:					
Total	1,168.60	57.20	.....	1,111.40	.0
Average	116.86	5.72	4.89	111.14	.0
Preservative period.					
First subperiod:					
Total	610.60	27.24	.....	583.36	.50
Average	122.12	5.45	4.46	116.67	.10
Second subperiod:					
Total	594.30	26.52	.....	567.78	1.00
Average	118.86	5.30	4.46	113.56	.20
Third subperiod:					
Total	481.05	25.15	.....	455.90	.70
Average	96.21	5.03	5.23	91.18	.14
First, second, and third subperiods:					
Total	1,685.95	78.91	.....	1,607.04	2.20
Average	112.40	5.26	4.68	107.14	.15
After period.					
First subperiod:					
Total	607.93	32.25	.....	575.68	.0
Average	121.59	6.45	5.30	115.14	.0
Second subperiod:					
Total	586.48	27.87	.....	558.61	.0
Average	117.30	5.57	4.75	111.73	.0
Entire after period:					
Total	1,194.41	60.12	.....	1,134.29	.0
Average	119.44	6.01	5.03	113.43	.0

TABLE XIII.—*Fat balances for Series IX*—Continued.

[Averages are per day.]

No. 11.

Period.	1 In food.	2 In feces.	3 In feces (2÷1).	4 Balance (1−2).	5 Formaldehyde administered.
Fore period.					
First subperiod:	*Grams.*	*Grams.*	*Per cent.*	*Grams.*	*Grams.*
Total	625.40	26.18		599.22	0.0
Average	125.08	5.24	4.19	119.84	.0
Second subperiod:					
Total	696.73	28.24		668.49	.0
Average	139.35	5.65	4.05	133.70	.0
Entire fore period:					
Total	1,322.13	54.42		1,267.71	.0
Average	132.21	5.44	4.12	126.77	.0
Preservative period.					
First subperiod:					
Total	685.13	23.86		661.27	.50
Average	137.03	4.77	3.48	132.26	.10
Second subperiod:					
Total	672.70	25.16		647.54	1.00
Average	134.54	5.03	3.74	129.51	.20
Third subperiod:					
Total	694.15	33.42		660.73	1.00
Average	138.83	6.68	4.81	132.15	.20
First, second, and third subperiods:					
Total	2,051.98	82.44		1,969.54	2.50
Average	136.80	5.50	4.02	131.30	.17
After period.					
First subperiod:					
Total	682.92	33.67		649.25	.0
Average	136.58	6.73	4.93	129.85	.0
Second subperiod:					
Total	663.63	27.34		636.29	.0
Average	132.73	5.47	4.12	127.26	.0
Entire after period:					
Total	1,346.55	61.01		1,285.54	.0
Average	134.66	6.10	4.53	128.56	.0

TABLE XIII.—*Fat balances for Series IX*—Continued.

[Averages are per day.]

No. 12.

Period.	1 In food.	2 In feces.	3 In feces (2÷1).	4 Balance (1−2).	5 Formaldehyde administered.
Fore period.					
First subperiod:	*Grams.*	*Grams.*	*Per cent.*	*Grams.*	*Grams.*
Total	561.02	19.13	.....	541.89	0.0
Average	112.20	3.83	3.41	108.37	.0
Second subperiod:					
Total	619.39	13.14	.....	606.25	.0
Average	123.88	2.63	2.12	121.25	.0
Entire fore period:					
Total	1,180.41	32.27	.....	1,148.14	.0
Average	118.04	3.23	2.73	114.81	.0
Preservative period.					
First subperiod:					
Total	607.74	23.72	.....	584.02	0.50
Average	121.55	4.74	3.90	116.81	.10
Second subperiod:					
Total	594.54	14.88	.....	579.66	1.00
Average	118.91	2.98	2.50	115.93	.20
Third subperiod:					
Total	602.08	17.55	.....	584.53	1.00
Average	120.42	3.51	2.91	116.91	.20
First, second, and third subperiods:					
Total	1,804.36	56.15	.....	1,784.21	2.56
Average	120.29	3.74	3.11	116.55	.17
After period.					
First subperiod:					
Total	606.51	20.72	.....	585.79	.0
Average	121.30	4.14	3.42	117.16	.0
Second subperiod:					
Total	598.69	13.82	.....	584.87	.0
Average	119.74	2.76	2.31	116.98	.0
Entire after period:					
Total	1,205.20	34.54	.....	1,170.66	.0
Average	120.52	3.45	2.87	117.07	.0

TABLE XIII.—*Fat balances for Series IX*—Continued.

SUMMARIES.

[Averages are per man per day.]

Nos. 1 to 6.

Period.	1 In food.	2 In feces.	3 In feces (2÷1).	4 Balance (1−2).	5 Formaldehyde administered.
Fore period.					
First subperiod:	*Grams.*	*Grams.*	*Per cent.*	*Grams.*	*Grams.*
Total	2,659.92	117.51	4.42	2,542.41	0.0
Average	88.66	3.92	.....	84.74	.0
Second subperiod:					
Total	2,910.20	107.54	3.70	2,802.66	.0
Average	97.01	3.58	.....	93.43	.0
Entire fore period:					
Total	5,570.12	225.05	4.04	5,345.07	.0
Average	92.84	3.75	.....	89.09	.0
Preservative period.					
First subperiod:					
Total	2,822.65	90.76	3.22	2,731.89	3.00
Average	94.09	3.03	.....	91.06	.10
Second subperiod:					
Total	2,795.71	87.32	3.12	2,708.39	6.00
Average	93.19	2.91	.....	90.28	.20
Third subperiod:					
Total	2,869.90	105.04	3.66	2,764.86	5.70
Average	95.66	3.50	.....	92.16	.19
First, second, and third subperiods.					
Total	8,488.26	283.12	3.34	8,205.14	14.70
Average	94.31	3.15	.....	91.16	.16
After period.					
First subperiod:					
Total	2,854.38	111.50	3.91	2,742.88	.0
Average	95.15	3.72	.....	91.43	.0
Second subperiod:					
Total	2,733.93	109.21	3.99	2,624.72	.0
Average	91.13	3.64	.....	87.49	.0
Entire after period:					
Total	5,588.31	220.71	3.95	5,367.60	.0
Average	93.14	3.68	.....	89.46	.0

TABLE XIII.—*Fat balances for Series IX*—Continued.

SUMMARIES—Continued.

[Averages are per man per day.]

Nos. 7, 10, 11, and 12.

Period.	1 In food.	2 In feces.	3 In feces (2÷1).	4 Balance (1−2).	5 Formaldehyde administered.
Fore period.					
First subperiod:	*Grams.*	*Grams.*	*Per cent.*	*Grams.*	*Grams.*
Total	2,152.64	84.41	3.92	2,068.23	0.0
Average	107.63	4.22	.....	103.41	.0
Second subperiod:					
Total	2,382.80	87.26	3.66	2,295.54	.0
Average	119.14	4.36	.....	114.78	.0
Entire fore period:					
Total	4,535.44	171.67	3.79	4,363.77	.0
Average	113.39	4.29	.....	109.10	.0
Preservative period.					
First subperiod:					
Total	2,344.96	86.06	3.67	2,258.90	2.00
Average	117.25	4.30	.....	112.95	.10
Second subperiod:					
Total	2,291.81	76.66	3.34	2,215.15	4.00
Average	114.59	3.83	.....	110.76	.20
Third subperiod:					
Total	2,218.83	91.60	4.13	2,127.23	3.70
Average	110.94	4.58	.....	106.36	.19
First, second, and third subperiods:					
Total	6,855.60	254.32	3.71	6,601.28	9.70
Average	114.26	4.24	.....	110.02	.16
After period.					
First subperiod:					
Total	2,345.32	91.47	3.90	2,253.85	.0
Average	117.27	4.57	.....	112.70	.0
Second subperiod:					
Total	2,270.97	85.46	3.76	2,185.51	.0
Average	113.55	4.27	.....	109.28	.0
Entire after period:					
Total	4,616.29	176.93	3.83	4,439.36	.0
Average	115.41	4.42	.....	110.99	.0

TABLE XIII.—*Fat balances for Series IX*—Continued.

SUMMARIES—Continued.

[Averages are per man per day.]

Nos. 1 to 12 (omitting Nos. 8 and 9).

Period.	1 In food.	2 In feces.	3 In feces (2÷1).	4 Balance (1−2).	5 Formaldehyde administered.
Fore period.					
First subperiod:	*Grams.*	*Grams.*	*Per cent.*	*Grams.*	*Grams.*
Total	4,812.56	201.92	4.20	4,610.64	0.0
Average	96.25	4.04	.....	92.21	.0
Second subperiod:					
Total	5,293.00	194.80	3.68	5,098.20	.0
Average	105.86	3.90	.....	101.96	.0
Entire fore period:					
Total	10,105.56	396.72	3.93	9,708.84	.0
Average	101.06	3.97	.....	97.09	.0
Preservative period.					
First subperiod:					
Total	5,167.61	176.82	3.42	4,990.79	5.00
Average	103.35	3.54	.....	99.82	.10
Second subperiod:					
Total	5,087.52	163.98	3.22	4,923.54	10.00
Average	101.75	3.28	.....	98.47	.20
Third subperiod:					
Total	5,088.73	196.64	3.86	4,892.09	9.40
Average	101.77	3.93	.....	97.84	.19
First, second, and third subperiods:					
Total	15,343.86	537.44	3.50	14,806.42	24.40
Average	102.29	3.58	.....	98.71	.16
After period.					
First subperiod:					
Total	5,199.70	202.97	3.90	4,996.73	.0
Average	103.99	4.06	.....	99.93	.0
Second subperiod:					
Total	5,004.90	194.67	3.89	4,810.23	.0
Average	100.10	3.89	.....	96.20	.0
Entire after period:					
Total	10,204.60	397.64	3.90	9,806.96	.0
Average	102.05	3.98	.....	98.07	.0

CALORIES BALANCE.

INDIVIDUAL DATA.

As it has been shown that the formaldehyde tends to diminish the amount of fat excreted in the feces, it is evident that, in so far as the feces are concerned, the calories would probably be diminished during the preservative period. The balances, therefore, should as a rule be slightly increased, provided the calories exhibited in the food are reasonably constant.

In the case of No. 1 it is seen that the balance of the calories in the preservative period is greater than in either of the other periods, but this increase is less than the increase in ingestion. While the calories in the feces are decreased, as would be expected, the number in the urine is increased, resulting in a very slight increase in total excretion.

In the case of No. 2 the balance is 54 calories larger in the preservative period than in the fore period, but the increase in ingestion amounts to 44 calories and the balance is further increased in the after period, although the ingestion is very slightly decreased, showing a continued effect in diminishing the calories excreted in the feces and urine. In this case there is a decreased excretion in both feces and urine amounting to 10 calories.

No. 3 also shows an increase of 33 calories in the balance of the preservative period, the increase in ingestion being only 24 calories. The decreased excretion in both feces and urine amounts to only 9 calories.

In the case of No. 4 the balance is increased 42 calories daily in the preservative period, owing to the increased ingestion, which amounts to 53 calories daily, there being an increased excretion in both feces and urine amounting to 11 calories daily.

In the case of No. 5 the balance in the preservative period is 24 calories greater daily than in the fore period, while a decrease amounting to 55 calories takes place in the after period. The increase in ingestion amounts to only 12 calories daily, followed by a decrease of 58 calories in the after period. There is a decrease in the calories excreted in both feces and urine amounting to 12 calories daily, a percentage loss of less than 0.5 per cent, while in the after period the percentage data show no further change. Again the tendency to decrease the excretion of calories is shown in this case.

In the case of No. 6 the balance in the preservative period exceeds that in the fore period by 33 calories daily, and is further increased by 40 calories in the after period. The increase in ingestion amounts to only 5 calories in the preservative period, with a further increase of 32 calories in the after period. There is a decrease in total excretion of 28 calories, or about 1 per cent, due to the feces, the calories in the urine being very slightly increased.

In the case of No. 7 the balance in the preservative period is larger than in either of the other periods, exceeding the fore period by 51 calories, while the ingestion increases only 14 calories. There is also a marked decrease in the calories excreted both in the feces and the urine, amounting to 37 daily, a percentage decrease of 1.27, followed by a further decrease in the after period.

The data for No. 8 are of no comparative value, but as far as they go they conform to the general tendency shown to decrease excretion and increase the balance.

While the data for No. 10 show a decrease of 124 calories in the balance in the preservative period, there is also a decrease in ingestion of 136 calories; in other words, relatively there is a gain in the balance, and this is shown by the excretion data, a decrease occurring both

in the feces and urine amounting to 12 calories daily, the percentage decrease being very slight.

No. 11 exhibits the usual variations, the balance in the preservative period being increased 66 calories and the amount ingested 58 calories, the increase in excretion occurring only in the urine and being very slight.

In the case of No. 12 the variations both in the balances and in the excretion data are so slight as to be negligible; the decrease in the balance, however, is less than the decrease in ingestion, showing a tendency to decrease excretion.

SUMMARIES.

In the summary for Nos. 1 to 6 it is seen that the balance in the preservative period exceeds that of the fore period by 32 calories daily, while the ingestion increases 24 calories. There is accordingly a slight decrease in the calories excreted both in the feces and urine amounting to 8 calories, a decrease of only 0.3 per cent. In the after period there is a tendency to return to the condition of the fore period. These figures show that a greater proportion of the food ingested is absorbed in the intestinal canal during the administration of the preservative.

In the summary for Nos. 7, 10, 11, and 12 the balance for the preservative period is practically unchanged, being only 4 calories less than in the fore period; there is, however, an accompanying decrease in ingestion of 18 calories and of 14 calories daily in the total excretion. These data, therefore, notwithstanding the decrease in the balance, exhibit to a very slight degree the tendency shown in the preceding summary to increase the absorption of food from the intestinal canal.

The general effect shown in the summary for Nos. 1 to 12 indicates an increase of 17 calories in the balance for the preservative period, while in the after period there is practically no further change. The average increase in ingestion is only 7 calories. The decrease in total excretion is 10 calories daily, or 0.36 per cent, and the figures for the after period are almost the same as for the preservative period.

In eight cases out of ten the excretion of calories is very slightly decreased in the preservative period, and the general conclusion is that formaldehyde tends to increase somewhat the absorption of the heat-forming elements of the food during the preservative period.

TABLE XIV.—*Calories balances for Series IX.*

[Averages are per day.]

No. 1.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.	*Calories.*	*Calories.*	*Calories.*	*Calories.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*	*Grams.*
First subperiod:									
Total	13,184	347	329	676				12,508	0.0
Average	2,637	69	66	135	2.63	2.50	5.13	2,502	.0
Second subperiod:									
Total	13,528	479	336	815				12,713	.0
Average	2,706	96	67	163	3.54	2.48	6.02	2,543	.0
Entire fore period:									
Total	26,712	826	665	1,491				25,221	.0
Average	2,671	83	67	149	3.09	2.49	5.58	2,522	.0
Preservative period.									
First subperiod:									
Total	13,635	430	335	765				12,870	.50
Average	2,727	86	67	153	3.15	2.46	5.61	2,574	.10
Second subperiod:									
Total	13,115	396	364	760				12,355	1.00
Average	2,623	79	73	152	3.02	2.78	5.79	2,471	.20
Third subperiod:									
Total	13,438	394	348	742				12,696	1.00
Average	2,688	79	70	148	2.93	2.59	5.52	2,540	.20
Entire preservative period:									
Total	40,188	1,220	1,047	2,267				37,921	2.50
Average	2,679	81	70	151	3.04	2.61	5.64	2,528	.17
After period.									
First subperiod:									
Total	13,441	482	308	790				12,651	.0
Average	2,688	96	62	158	3.59	2.29	5.88	2,530	.0
Second subperiod:									
Total	13,152	508	332	840				12,312	.0
Average	2,630	102	66	168	3.86	2.52	6.39	2,462	.0
Entire after period:									
Total	26,593	990	640	1,630				24,963	.0
Average	2,659	99	64	163	3.72	2.41	6.13	2,496	.0

TABLE XIV.—*Calories balances for Series IX*—Continued.

[Averages are per day.]

No. 2.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.	*Calories.*	*Calories.*	*Calories.*	*Calories.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*	*Grams*
First subperiod:									
Total	14,978	764	432	1,196				13,782	0.0
Average	2,996	153	86	239	5.10	2.88	7.99	2,757	.0
Second subperiod:									
Total	15,663	659	425	1,084				14,579	.0
Average	3,133	132	85	217	4.21	2.71	6.92	2,916	.0
Entire fore period:									
Total	30,641	1,423	857	2,280				28,361	.0
Average	3,064	142	86	228	4.64	2.80	7.44	2,836	.0
Preservative period.									
First subperiod:									
Total	15,885	702	383	1,085				14,800	.50
Average	3,177	140	77	217	4.42	2.41	6.83	2,960	.10
Second subperiod:									
Total	15,091	585	407	992				14,099	1.00
Average	3,018	117	81	198	3.88	2.70	6.57	2,820	.20
Third subperiod:									
Total	15,649	765	426	1,191				14,458	1.00
Average	3,130	153	85	238	4.89	2.72	7.61	2,892	.20
Entire preservative period:									
Total	46,625	2,052	1,216	3,268				43,357	2.50
Average	3 108	137	81	218	4.40	2.61	7.01	2,890	.17
After period.									
First subperiod:									
Total	15,805	634	404	1,038				14,767	.0
Average	3,161	127	81	208	4.01	2.56	6.57	2,953	.0
Second subperiod:									
Total	15,215	537	431	968				14,247	.0
Average	3,043	107	86	194	3.53	2.83	6.36	2,849	.0
Entire after period:									
Total	31,020	1,171	835	2,006				29,014	.0
Average	3,102	117	84	201	3.77	2.69	6.47	2,901	.0

TABLE XIV.—*Calories balances for Series IX*—Continued.

[Averages are per day.]

No. 3.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.	*Calories.*	*Calories.*	*Calories.*	*Calories.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*	*Grams.*
First subperiod:									
Total	15,979	630	419	1,049				14,930	0.0
Average	3,196	126	84	210	3.94	2.62	6.56	2,986	.0
Second subperiod:									
Total	16,375	502	398	900				15,475	.0
Average	3,275	100	80	180	3.07	2.43	5.50	3,095	.0
Entire fore period:									
Total	32,354	1,132	817	1,949				30,405	.0
Average	3,235	113	82	195	3.50	2.53	6.02	3,040	.0
Preservative period.									
First subperiod:									
Total	16,451	547	404	951				15,500	.50
Average	3,290	109	81	190	3.33	2.46	5.78	3,100	.10
Second subperiod:									
Total	15,821	398	400	798				15,023	1.00
Average	3,164	80	80	160	2.52	2.53	5.04	3,004	.20
Third subperiod:									
Total	16,607	655	382	1,037				15,570	1.00
Average	3,321	131	76	207	3.94	2.30	6.24	3,114	.20
Entire preservative period:									
Total	48,879	1,600	1,186	2,786				46,093	2.50
Average	3,259	107	79	186	3.27	2.43	5.70	3,073	.17
After period.									
First subperiod:									
Total	16,271	482	390	872				15,399	.0
Average	3,254	96	78	174	2.96	2.40	5.36	3,080	.0
Second subperiod:									
Total	16,075	843	390	1,233				14,842	.0
Average	3,215	169	78	247	5.24	2.43	7.67	2,968	.0
Entire after period:									
Total	32,346	1,325	780	2,105				30,241	.0
Average	3,235	133	78	211	4.10	2.41	6.51	3,024	.0

TABLE XIV.—*Calories balances for Series IX*—Continued.

[Averages are per day.]

No. 4.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.	*Calories.*	*Calories.*	*Calories.*	*Calories.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*	*Grams.*
First subperiod:									
Total	15,209	557	388	945				14,264	0.0
Average	3,042	111	78	189	3.66	2.55	6.21	2,853	.0
Second subperiod:									
Total	16,038	644	417	1,061				14,977	.0
Average	3,208	129	83	212	4.02	2.60	6.62	2,996	.0
Entire fore period:									
Total	31,247	1,201	805	2,006				29,241	.0
Average	3,125	120	81	201	3.84	2.58	6.42	2,924	.0
Preservative period.									
First subperiod:									
Total	16,063	602	412	1,014				15,049	.50
Average	3,213	120	82	203	3.75	2.56	6.31	3,010	.10
Second subperiod:									
Total	15,434	604	413	1,017				14,417	1.00
Average	3,087	121	83	203	3.91	2.68	6.59	2,884	.20
Third subperiod:									
Total	16,172	735	410	1,145				15,027	1.00
Average	3,234	147	82	229	4.54	2.54	7.08	3,005	.20
Entire preservative period:									
Total	47,669	1,941	1,235	3,176				44,493	2.50
Average	3,178	129	82	212	4.07	2.59	6.66	2,966	.17
After period.									
First subperiod:									
Total	15,881	713	369	1,082				14,799	.0
Average	3,176	143	74	216	4.49	2.32	6.81	2,960	.0
Second subperiod:									
Total	15,641	727	385	1,112				14,529	.0
Average	3,128	145	77	222	4.65	2.46	7.11	2,906	.0
Entire after period:									
Total	31,522	1,440	754	2,194				29,328	.0
Average	3,152	144	75	219	4.57	2.39	6.96	2,933	.0

TABLE XIV.—*Calories balances for Series IX*—Continued.

[Averages are per day.]

No. 5.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.	*Calories.*	*Calories.*	*Calories.*	*Calories.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*	*Grams.*
First subperiod:									
Total	14,354	551	326	877				13,477	0.0
Average	2,871	110	65	175	3.84	2.27	6.11	2,696	.0
Second subperiod:									
Total	14,547	405	343	748				13,799	.0
Average	2,909	81	69	150	2.78	2.36	5.14	2,759	.0
Entire fore period:									
Total	28,901	956	669	1,625				27,276	.0
Average	2,890	96	67	163	3.31	2.31	5.62	2,727	.0
Preservative period.									
First subperiod:									
Total	14,606	434	315	749				13,857	.50
Average	2,921	87	63	150	2.97	2.16	5.13	2,771	.10
Second subperiod:									
Total	14,197	427	325	752				13,445	1.00
Average	2,839	85	65	150	3.01	2.29	5.30	2,689	.20
Third subperiod:									
Total	14,720	448	313	761				13,959	1.00
Average	2,944	90	63	152	3.04	2.13	5.17	2,792	.20
Entire preservative period:									
Total	43,523	1,309	953	2,262				41,261	2.50
Average	2,902	87	64	151	3.01	2.19	5.20	2,751	.17
After period.									
First subperiod:									
Total	14,429	412	311	723				13,706	.0
Average	2,886	82	62	145	2.86	2.16	5.01	12,741	.0
Second subperiod:									
Total	14,015	403	352	755				13,260	.0
Average	2,803	81	70	151	2.88	2.51	5.39	2,652	.0
Entire after period:									
Total	28,444	815	663	1,478				26,966	.0
Average	2,844	82	66	148	2.87	2.33	5.20	2,696	.0

TABLE XIV.—*Calories balances for Series IX*—Continued.

[Averages are per day.]

No. 6.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.	*Calories.*	*Calories.*	*Calories.*	*Calories.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*	*Grams.*
First subperiod:									
Total	14,940	635	329	964				13,976	0.0
Average	2,988	127	66	193	4.25	2.20	6.45	2,795	.0
Second subperiod:									
Total	14,936	722	347	1,069				13,867	.0
Average	2,987	144	69	214	4.83	2.32	7.16	2,773	.0
Entire fore period:									
Total	29,876	1,357	676	2,033				27,843	.0
Average	2,988	136	68	203	4.54	2.26	6.80	2,785	.0
Preservative period.									
First subperiod:									
Total	15,076	517	354	871				14,205	.50
Average	3,015	103	71	174	3.43	2.35	5.78	2,841	.10
Second subperiod:									
Total	14,615	588	333	921				13,694	1.00
Average	2,923	118	67	184	4.02	2.28	6.30	2,739	.20
Third subperiod:									
Total	15,211	483	344	827				14,384	.70
Average	3,042	97	69	165	3.18	2.26	5.44	2,877	.14
Entire preservative period:									
Total	44,902	1,588	1,031	2,619				42,283	2.20
Average	2,993	106	69	175	3.54	2.30	5.83	2,818	.15
After period.									
First subperiod:									
Total	15,313	503	313	816				14,497	.0
Average	3,063	101	63	163	3.28	2.04	5.33	2,900	.0
Second subperiod:									
Total	14,933	541	313	854				14,079	.0
Average	2,987	108	63	171	3.62	2.10	5.72	2,816	.0
Entire after period:									
Total	30,246	1,044	626	1,670				28,576	.0
Average	3,025	104	63	167	3.45	2.07	5.52	2,858	.0

TABLE XIV.—*Calories balances for Series IX*—Continued.

[Averages are per day.]

No. 7.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Calories.*	*Calories.*	*Calories.*	*Calories.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*	*Grams.*
Total	14,842	621	a 421	1,042				13,800	0.0
Average	2,968	124	84	208	4.18	2.84	7.02	2,760	.0
Second subperiod:									
Total	15,163	621	421	1,042				14,121	.0
Average	3,033	124	84	208	4.10	2.78	6.87	2,825	.0
Entire fore period:									
Total	30,005	1,242	842	2,084				27,921	.0
Average	3,001	124	84	208	4.14	2.81	6.95	2,793	.0
Preservative period.									
First subperiod:									
Total	15,411	492	381	873				14,538	.50
Average	3,082	98	76	175	3.19	2.47	5.66	2,907	.10
Second subperiod:									
Total	14,672	438	376	814				13,858	1.00
Average	2,934	88	75	163	2.99	2.56	5.55	2,771	.20
Third subperiod:									
Total	15,142	516	365	881				14,261	1.00
Average	3,028	103	73	176	3.41	2.41	5.82	2,852	.20
Entire preservative period:									
Total	45,225	1,446	1,122	2,568				42,657	2.50
Average	3,015	96	75	171	3.20	2.48	5.68	2,844	.17
After period.									
First subperiod:									
Total	15,091	178	342	520				14,571	.0
Average	3,018	36	68	104	1.18	2.27	3.45	2,914	.0
Second subperiod:									
Total	14,755	637	393	1,030				13,725	.0
Average	2,951	127	79	206	4.32	2.66	6.98	2,745	.0
Entire after period:									
Total	29,846	815	735	1,550				28,296	.0
Average	2,985	82	74	155	2.73	2.46	5.19	2,830	.0

a Average for one day added to complete record.

TABLE XIV.—*Calories balances for Series IX*—Continued.

[Averages are per day.]

No. 8.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
	Calories.	*Calories.*	*Calories.*	*Calories.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*	*Grams.*
First subperiod:									
Total	18,152	684	474	1,158				16,994	0.0
Average	3,630	137	95	232	3.77	2.61	6.38	3,398	.0
Second subperiod:									
Total	18,665	676	454	1,130				17,535	.0
Average	3,733	135	91	226	3.62	2.43	6.05	3,507	.0
Entire fore period:									
Total	36,817	1,360	928	2,288				34,529	.0
Average	3,682	136	93	229	3.69	2.52	6.21	3,453	.0
Preservative period.									
First subperiod:									
Total	18,757	645	446	1,091				17,666	.50
Average	3,751	129	89	218	3.44	2.38	5.82	3,533	.10
Second subperiod:									
Total	18,423	655	455	1,110				17,313	1.00
Average	3,685	131	91	222	3.56	2.47	6.03	3,463	.20
First and second subperiods:									
Total	37,180	1,300	901	2,201				34,979	1.50
Average	3,718	130	90	220	3.50	2.42	5.92	3,498	.15

TABLE XIV.—*Calories balances for Series IX*—Continued.

[Averages are per day.]

No. 10.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered
Fore period.	*Calories.*	*Calories.*	*Calories.*	*Calories.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*	*Grams.*
First subperiod:									
Total	15,324	516	452	968				14,356	0.0
Average	3,065	103	90	194	3.37	2.95	6.32	2,871	.0
Second subperiod:									
Total	16,037	701	441	1,142				14,895	.0
Average	3,207	140	88	228	4.37	2.75	7.12	2,979	.0
Entire fore period:									
Total	31,361	1,217	893	2,110				29,251	.0
Average	3,136	122	89	211	3.88	2.85	6.73	2,925	.0
Preservative period.									
First subperiod:									
Total	16,325	659	450	1,109				15,216	.50
Average	3,265	132	90	222	4.04	2.76	6.79	3,043	.10
Second subperiod:									
Total	15,599	527	445	972				14,627	1.00
Average	3,120	105	89	194	3.38	2.85	6.23	2,926	.20
Third subperiod:									
Total	13,081	499	409	908				12,173	.70
Average	2,616	100	82	182	3.81	3.13	6.94	2,434	.14
Entire preservative period:									
Total	45,005	1,685	1,304	2,989				42,016	2.20
Average	3,000	112	87	199	3.74	2.90	6.64	2,801	.15
After period.									
First subperiod:									
Total	16,019	656	452	1,108				14,911	.0
Average	3,204	131	90	222	4.10	2.82	6.92	2,982	.0
Second subperiod:									
Total	15,818	628	460	1,088				14,730	.0
Average	3,164	126	92	218	3.97	2.91	6.88	2,946	.0
Entire after period:									
Total	31,837	1,284	912	2,196				29,641	.0
Average	3,184	128	91	220	4.03	2.86	6.90	2,964	.0

TABLE XIV.—*Calories balances for Series IX*—Continued.

[Averages are per day.]

No. 11.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.	*Calories.*	*Calories.*	*Calories.*	*Calories.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*	*Grams.*
First subperiod:									
Total	16,377	621	366	987				15,390	0.0
Average	3,275	124	73	197	3.79	2.23	6.03	3,078	.0
Second subperiod:									
Total	17,188	599	364	963				16,225	.0
Average	3,438	120	73	193	3.48	2.12	5.60	3,245	.0
Entire fore period:									
Total	33,565	1,220	730	1,950				31,615	.0
Average	3,357	122	73	195	3.63	2.17	5.81	3,162	.0
Preservative period.									
First subperiod:									
Total	17,400	515	356	871				16,529	.50
Average	3,480	103	71	174	2.96	2.05	5.01	3,306	.10
Second subperiod:									
Total	16,632	514	388	902				15,730	1.00
Average	3,326	103	78	180	3.09	2.33	5.42	3,146	.20
Third subperiod:									
Total	17,199	659	378	1,037				16,162	1.00
Average	3,440	132	76	207	3.83	2.20	6.03	3,233	.20
Entire preservative period:									
Total	51,231	1,688	1,122	2,810				48,421	2.50
Average	3,415	113	75	187	3.29	2.19	5.48	3,228	.17
After period.									
First subperiod:									
Total	16,931	642	391	1,033				15,898	.0
Average	3,386	128	78	207	3.79	2.31	6.10	3,179	.0
Second subperiod:									
Total	16,813	633	403	1,036				15,777	.0
Average	3,363	127	81	207	3.76	2.40	6.16	3,156	.0
Entire after period:									
Total	33,744	1,275	794	2,069				31,675	.0
Average	3,374	128	79	207	3.78	2.35	6.13	3,167	.0

TABLE XIV.—*Calories balances for Series IX*—Continued.

[Averages are per day.]

No. 12.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.	*Calories.*	*Calories.*	*Calories.*	*Calories.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*	*Grams.*
First subperiod:									
Total	16,846	661	452	1,113				15,733	0.0
Average	3,369	132	90	223	3.92	2.68	6.61	3,146	.0
Second subperiod:									
Total	17,147	703	372	1,075				16,072	.0
Average	3,429	141	74	215	4.10	2.17	6.27	3,214	.0
Entire fore period:									
Total	33,993	1,364	824	2,188				31,805	.0
Average	3,399	136	82	219	4.01	2.42	6.44	3,180	.0
Preservative period.									
First subperiod:									
Total	17,239	907	405	1,312				15,927	.50
Average	3,448	181	81	262	5.26	2.35	7.61	3,186	.10
Second subperiod:									
Total	16,569	555	405	960				15,609	1.00
Average	3,314	111	81	192	3.35	2.44	5.79	3,122	.20
Third subperiod:									
Total	17,059	566	408	974				16,085	1.00
Average	3,412	113	82	195	3.32	2.39	5.71	3,217	.20
Entire preservative period:									
Total	50,867	2,028	1,218	3,246				47,621	2.50
Average	3,391	135	81	216	3.99	2.39	6.38	3,175	.17
After period.									
First subperiod:									
Total	16,928	565	413	978				15,950	.0
Average	3,386	113	83	196	3.34	2.44	5.78	3,190	.0
Second subperiod:									
Total	16,899	494	424	918				15,981	.0
Average	3,380	99	85	184	2.92	2.51	5.43	3,196	.0
Entire after period:									
Total	33,827	1,059	837	1,896				31,931	.0
Average	3,383	106	84	190	3.13	2.47	5.60	3,193	.0

TABLE XIV.—*Calories balances for Series IX*—Continued.

SUMMARIES.

[Averages are per man per day.]

Nos. 1 to 6.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Calories.*	*Calories.*	*Calories.*	*Calories.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*	*Grams.*
Total	88,644	3,484	2,223	5,707	3.93	2.51	6.44	82,937	0.0
Average	2,955	116	74	190				2,765	.0
Second subperiod:									
Total	91,087	3,411	2,266	5,677	3.74	2.49	6.23	85,410	.0
Average	3,036	114	76	189				2,847	.0
Entire fore period:									
Total	179,731	6,895	4,489	11,384	3.84	2.50	6.33	168,347	.0
Average	2,996	115	75	190				2,806	.0
Preservative period.									
First subperiod:									
Total	91,716	3,232	2,203	5,435	3.52	2.40	5.93	86,281	3.00
Average	3,057	108	73	181				2,876	.10
Second subperiod:									
Total	88,273	2,998	2,242	5,240	3.40	2.54	5.94	83,033	6.00
Average	2,942	100	75	175				2,767	.20
Third subperiod:									
Total	91,797	3,480	2,223	5,703	3.79	2.42	6.21	86,094	5.70
Average	3,060	116	74	190				2,870	.19
Entire preservative period:									
Total	271,786	9,710	6,668	16,378	3.57	2.45	6.03	255,408	14.70
Average	3,020	108	74	182				2,838	.16
After period.									
First subperiod:									
Total	91,140	3,226	2,095	5,321	3.54	2.30	5.84	85,819	.0
Average	3,038	108	70	177				2,861	.0
Second subperiod:									
Total	89,031	3,559	2,203	5,762	4.00	2.47	6.47	83,269	.0
Average	2,968	119	73	192				2,776	.0
Entire after period:									
Total	180,171	6,785	4,298	11,083	3.77	2.39	6.15	169,088	.0
Average	3,003	113	72	185				2,818	.0

TABLE XIV.—*Calories balances for Series IX*—Continued.

SUMMARIES—Continued.

[Averages are per man per day.]

Nos. 7, 10, 11, and 12.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Calories.*	*Calories.*	*Calories.*	*Calories.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*	*Grams.*
Total	63,389	2,419	1,691	4,110	3.82	2.67	6.48	59,279	0.0
Average	3,169	121	85	206				2,963	.0
Second subperiod:									
Total	65,535	2,624	1,598	4,222	4.00	2.44	6.44	61,313	.0
Average	3,277	131	80	211				3,066	.0
Entire fore period:									
Total	128,924	5,043	3,289	8,332	3.91	2.55	6.46	120,592	.0
Average	3,223	126	82	208				3,015	.0
Preservative period.									
First subperiod:									
Total	66,375	2,573	1,592	4,165	3.88	2.40	6.27	62,210	2.00
Average	3,319	129	80	208				3,111	.10
Second subperiod:									
Total	63,472	2,034	1,614	3,648	3.20	2.54	5.75	59,824	4.00
Average	3,174	102	81	182				2,992	.20
Third subperiod:									
Total	62,481	2,240	1,560	3,800	3.59	2.50	6.08	58,681	3.70
Average	3,124	112	78	190				2,934	.19
Entire preservative period:									
Total	192,328	6,847	4,766	11,613	3.56	2.48	6.04	180,715	9.70
Average	3,205	114	79	194				3,011	.16
After period.									
First subperiod:									
Total	64,969	2,041	1,598	3,639	3.14	2.46	5.60	61,330	.0
Average	3,248	102	80	182				3,066	.0
Second subperiod:									
Total	64,285	2,392	1,680	4,072	3.72	2.61	6.33	60,213	.0
Average	3,214	120	84	204				3,010	.0
Entire after period:									
Total	129,254	4,433	3,278	7,711	3.43	2.54	5.97	121,543	.0
Average	3,231	111	82	193				3,038	.0

TABLE XIV.—*Calories balances for Series IX*—Continued.

SUMMARIES—Continued.

[Averages are per man per day.]

Nos. 1 to 12 (omitting Nos. 8 and 9).

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered
Fore period.	*Calories.*	*Calories.*	*Calories.*	*Calories.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*	*Grams.*
First subperiod:									
Total	152,033	5,903	3,914	9,817	3.88	2.57	6.46	142,216	0.0
Average	3,041	118	78	196				2,845	.0
Second subperiod:									
Total	156,622	6,035	3,864	9,899	3.85	2.47	6.32	146,723	.0
Average	3,132	121	77	198				2,934	.0
Entire fore period:									
Total	308,655	11,938	7,778	19,716	3.87	2.52	6.39	288,939	.0
Average	3,087	119	78	197				2,890	.0
Preservative period.									
First subperiod:									
Total	158,091	5,805	3,795	9,600	3.67	2.40	6.07	148,491	5.00
Average	3,162	116	76	192				2,970	.10
Second subperiod:									
Total	151,745	5,032	3,856	8,888	3.32	2.54	5.86	142,857	10.00
Average	3,035	101	77	178				2,857	.20
Third subperiod:									
Total	154,278	5,720	3,783	9,503	3.71	2.45	6.16	144,775	9.40
Average	3,086	114	76	190				2,896	.19
Entire preservative period:									
Total	464,114	16,557	11,434	27,991	3.57	2.46	6.03	436,123	24.40
Average	3,094	110	76	187				2,907	.16
After period.									
First subperiod:									
Total	156,109	5,267	3,693	8,960	3.37	2.37	5.74	147,149	.0
Average	3,122	105	74	179				2,943	.0
Second subperiod:									
Total	153,316	5,951	3,883	9,834	3.88	2.53	6.41	143,482	.0
Average	3,066	119	78	197				2,869	.0
Entire after period									
Total	309,425	11,218	7,576	18,794	3.62	2.45	6.07	290,631	.0
Average	3,094	112	76	188				2,906	.0

SOLIDS BALANCE.

INDIVIDUAL DATA.

The total solids in the food of No. 1 are almost the same in the three periods of observation, increasing only 2 grams in the preservative period. The quantity occurring in the feces is the same in the fore and preservative periods and is slightly increased in the after period. The quantity occurring in the urine is greatest in the preservative period, resulting in an increase in the feces and urine together of 3 grams in the preservative period. The percentage data show an increase of 0.5 per cent in the preservative period and a decrease in the balance of 1 gram. The data in this case do not show the tendency to increase absorption of food material which might be expected from the preceding data.

In the case of No. 2 there is an increase of 8 grams daily in the quantity of solids in the food in the preservative period, with a return in the after period to practically the figure of the fore period. The changes in the balance correspond almost exactly to those in ingestion, and the data on excretion also show that no appreciable effect was produced in this case by the formaldehyde on the excretion of total solids.

In the case of No. 3 the uniformity of the data in the fore and preservative periods is even more pronounced, showing again that no appreciable effect is produced on the excretion of the total solids.

In the case of No. 4 there is a slightly increased excretion of solids in the preservative period (4 grams daily), but not so great as the increase of the solids in the food (10 grams daily). The increase in the balance of 6 grams is therefore due entirely to the increased ingestion, the excretion being increased by 0.54 per cent. Therefore it may be said that there is practically no increase or decrease in the total solids excreted, a very slight tendency being shown to increase excretion, as would be expected from the preceding data for No. 4.

No appreciable effect is produced in the case of No. 5, and the slight variation which does occur can not be attributed to the use of formaldehyde, the increase in ingestion being 3 grams while the excretion increases only 2 grams. There is practically no variation in the per cent of total excretion.

In the case of No. 6 there is a notable diminution in the amount of solids in the feces during the preservative period, amounting to 5 grams daily, while the solids in the urine remain constant and the ingestion increases only 1 gram. The balance increases 6 grams daily in the preservative period and there is a slight decrease in total excretion of 0.87 per cent, and a further decrease of the same magnitude in the after period. In this case there seems to be a tendency on the part of the formaldehyde to promote the absorption of total solids.

The same effect is even more pronounced in the case of No. 7, the data showing an increased balance of 13 grams daily, with an increased ingestion of only 3 grams. The total excretion decreases 10 grams daily in the preservative period, equivalent to a decrease of 1.57 per cent. There is a further percentage decrease in the after period in the excretion of total solids, but the quantity ingested decreases to a greater extent than the amount excreted.

The data for No. 8 are fragmentary and of no value for comparison.

In the case of No. 10 there is a slight decrease in the excretion of the solids in both the feces and urine during the preservative period, amounting to 4 grams daily, but this is accompanied by a decrease

in ingestion of 26 grams, and the balance is therefore decreased by 22 grams, while the decrease in percentage elimination is so slight as to be negligible.

In the case of No. 11 there is a decrease in the solids in the feces and an increase in the solids in the urine, making the total excretion almost the same in the preservative period as in the fore period. The increase of 8 grams in the balance is more than offset by the increase of 9 grams in the amount ingested.

In the case of No. 12 there is a decrease of only 1 gram in the solids in the feces and an increase of 4 grams in the urine in the preservative period. This results in a slight percentage increase in total excretion and a decrease in the balance of 7 grams, while the amount ingested decreases only 4 grams daily. The excretion of solids in the feces is decreased in the after period, while the amount ingested is only very slightly decreased. In this case there is again no clear-cut effect produced on the excretion of total solids, though there is a slight tendency to increase excretion in the preservative period and decrease it in the after period.

SUMMARIES.

In the summary for Nos. 1 to 6, inclusive, it is seen that the quantity of solids in the food is identical in the fore and after periods, and increased by only 4 grams daily during the preservative period. The quantity excreted in the feces is slightly less in the preservative period, and the same in the after period as in the fore period. The quantity excreted in the urine is slightly greater in the preservative period and suffers no further change in the after period. The balance in the preservative period is increased by exactly the same amount as the solids ingested. It is evident from these data that while there is a slight decrease in the solids in the feces and a corresponding increase in the solids in the urine, there is practically no effect produced by the formaldehyde on the excretion of total solids.

In the summary of Nos. 7, 10, 11, and 12 there is a decrease of 5 grams daily in the solids in the food during the preservative period and a return to exactly the figures of the fore period in the after period. The decrease in the balance is less than in ingestion, and the percentage data show a decrease in total excretion (due to the solids in the feces) which is so slight as to be negligible.

The general summary for Nos. 1 to 12 shows practically the same quantity of solids in the food during the three periods, an increase of 1 gram in the preservative period being maintained in the after period. A slight decrease of 2 grams daily occurs in the solids excreted in the feces and an increase of only 1 gram in the solids excreted in the

urine. The balance increases 2 grams daily in the preservative period, and the percentage data show a correspondingly slight decrease in total excretion, due entirely to the decrease in the feces.

It is seen, therefore, that although there was a slight but uniform tendency, covering a large majority of cases, to decrease the excretion of nitrogen, sulphur, and fat, especially in the case of the latter constituent, the average effect, into which the marked decrease in the phosphoric-acid balance enters, is so slight as to be negligible, were it not for the uniform tendency shown in the previous studies. In view of all the data, a very slight tendency to decrease excretion, especially in the feces, and in the case of fat, may be noted.

TABLE XV.—*Solids balances for Series IX.*

[Averages are per day.]

No. 1.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	2,595	71	252	323				2,272	0.0
Average	519	14	50	65	2.74	9.71	12.45	454	.0
Second subperiod:									
Total	2,634	102	257	359				2,275	.0
Average	527	20	51	72	3.87	9.76	13.63	455	0
Entire fore period:									
Total	5,229	173	509	682				4,547	.0
Average	523	17	51	68	3.31	9.73	13.04	455	.0
Preservative period.									
First subperiod:									
Total	2,690	89	270	359				2,331	.50
Average	538	18	54	72	3.31	10.04	13.35	466	.10
Second subperiod:									
Total	2,555	83	272	355				2,200	1.00
Average	511	17	54	71	3.25	10.65	13.89	440	.20
Third subperiod:									
Total	2,636	84	269	353				2,283	1.00
Average	527	17	54	71	3.19	10.20	13.39	456	.20
Entire preservative period:									
Total	7,881	256	811	1,067				6,814	2.50
Average	525	17	54	71	3.25	10.29	13.54	454	.17
After period.									
First subperiod:									
Total	2,630	98	261	359				2,271	.0
Average	526	20	52	72	3.73	9.92	13.65	454	.0
Second subperiod:									
Total	2,585	106	263	369				2,216	.0
Average	517	21	53	74	4.10	10.17	14.27	443	.0
Entire after period:									
Total	5,215	204	524	728				4,487	.0
Average	522	20	52	73	3.91	10.05	13.96	449	.0

TABLE XV.—*Solids balances for Series IX*—Continued.

[Averages are per day.]

No. 2.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1—4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	2,992	133	308	441	.....	.....	.....	2,551	0.0
Average	598	27	62	88	4.45	10.29	14.74	510	.0
Second subperiod:									
Total	3,105	121	321	442	.....	.....	.....	2,663	.0
Average	621	24	64	88	3.90	10.34	14.24	533	.0
Entire fore period:									
Total	6,097	254	629	883	.....	.....	.....	5,214	.0
Average	610	25	63	88	4.17	10.32	14.48	522	.0
Preservative period.									
First subperiod:									
Total	3,184	130	310	440	.....	.....	.....	2,744	.50
Average	637	26	62	88	4.08	9.74	13.82	549	.10
Second subperiod:									
Total	2,990	110	316	426	.....	.....	.....	2,564	1.00
Average	598	22	63	85	3.68	10.57	14.25	513	.20
Third subperiod:									
Total	3,100	145	319	464	.....	.....	.....	2,636	1.00
Average	620	29	64	93	4.68	10.29	14.97	527	.20
Entire preservative period:									
Total	9,274	385	945	1,330	.....	.....	.....	7,944	2.50
Average	618	26	63	89	4.15	10.19	14.34	529	.17
After period.									
First subperiod:									
Total	3,055	117	321	438	.....	.....	.....	2,617	.0
Average	611	23	64	88	3.83	10.51	14.34	523	.0
Second subperiod:									
Total	3,038	103	332	435	.....	.....	.....	2,603	.0
Average	608	21	66	87	3.39	10.93	14.32	521	.0
Entire after period:									
Total	6,093	220	653	873	.....	.....	.....	5,220	.0
Average	609	22	65	87	3.61	10.72	14.33	522	.0

TABLE XV.—*Solids balances for Series IX*—Continued.

[Averages are per day.]

No. 3.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	3,164	132	299	431				2,733	0.0
Average	633	26	60	86	4.17	9.45	13.62	547	.0
Second subperiod:									
Total	3,198	109	292	401				2,797	.0
Average	640	22	58	80	3.41	9.13	12.54	560	.0
Entire fore period:									
Total	6,362	241	591	832				5,530	.0
Average	636	24	59	83	3.79	9.29	13.08	553	.0
Preservative period.									
First subperiod:									
Total	3,242	118	313	431				2,811	.50
Average	648	24	63	86	3.64	9.65	13.29	562	.10
Second subperiod:									
Total	3,091	85	293	378				2,713	1.00
Average	618	17	59	76	2.75	9.48	12.23	542	.20
Third subperiod:									
Total	3,256	142	298	440				2,816	1.00
Average	651	28	60	88	4.36	9.15	13.51	563	.20
Entire preservative period:									
Total	9,589	345	904	1,249				8,340	2.50
Average	639	23	60	83	3.60	9.43	13.03	556	.17
After period.									
First subperiod:									
Total	3,192	104	306	410				2,782	.0
Average	638	21	61	82	3.26	9.59	12.84	556	.0
Second subperiod:									
Total	3,167	170	308	478				2,689	.0
Average	633	34	62	96	5.37	9.73	15.09	537	.0
Entire after period:									
Total	6,359	274	614	888				5,471	.0
Average	636	27	61	89	4.31	9.66	13.96	547	.0

TABLE XV.—*Solids balances for Series IX*—Continued.

[Averages are per day.]

No. 4.

Period	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams*
Total	3,062	107	278	385				2,677	0.0
Average	612	21	56	77	3.49	9.08	12.57	535	.0
Second subperiod:									
Total	3,190	126	306	432				2,758	.0
Average	638	25	61	86	3.95	9.59	13.54	552	.0
Entire fore period:									
Total	6,252	233	584	817				5,435	.0
Average	625	23	58	82	3.73	9.34	13.07	543	.0
Preservative period.									
First subperiod:									
Total	3,226	123	307	430				2,796	.50
Average	645	25	61	86	3.81	9.52	13.33	559	.10
Second subperiod:									
Total	3,071	120	300	420				2,651	1.00
Average	614	24	60	84	3.91	9.77	13.68	530	.20
Third subperiod:									
Total	3,227	146	300	446				2,781	1.00
Average	645	29	60	89	4.52	9.30	13.82	556	.20
Entire preservative period:									
Total	9,524	389	907	1,296				8,228	2.50
Average	635	26	60	86	4.08	9.52	13.61	549	.17
After period.									
First subperiod:									
Total	3,166	142	284	426				2,740	.0
Average	633	28	57	85	4.49	8.97	13.46	548	.0
Second subperiod:									
Total	3,139	151	298	449				2,690	.0
Average	628	30	60	90	4.81	9.49	14.30	538	.0
Entire after period:									
Total	6,305	293	582	875				5,430	.0
Average	631	29	58	88	4.65	9.23	13.88	543	.0

TABLE XV.—*Solids balances for Series IX*—Continued.

[Averages are per day.]

No. 5.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	2,931	112	228	340				2,591	0.0
Average	586	22	46	68	3.82	7.78	11.60	518	.0
Second subperiod:									
Total	2,928	81	263	344				2,584	.0
Average	586	16	53	69	2.77	8.98	11.75	517	.0
Entire fore period:									
Total	5,859	193	491	684				5,175	.0
Average	586	19	49	68	3.29	8.38	11.67	518	.0
Preservative period.									
First subperiod:									
Total	2,984	90	257	347				2,637	.50
Average	597	18	51	69	3.02	8.61	11.63	528	.10
Second subperiod:									
Total	2,873	86	265	351				2,522	1.00
Average	575	17	53	70	2.99	9.22	12.22	505	.20
Third subperiod:									
Total	2,980	93	257	350				2,630	1.00
Average	596	19	51	70	3.12	8.62	11.74	526	.20
Entire preservative period:									
Total	8,837	269	779	1,048				7,789	2.50
Average	589	18	52	70	3.04	8.82	11.86	519	.17
After period.									
First subperiod:									
Total	2,928	79	251	330				2,598	.0
Average	586	16	50	66	2.70	8.57	11.27	520	.0
Second subperiod:									
Total	2,842	79	275	354				2,488	.0
Average	568	16	55	71	2.78	9.71	12.46	497	.0
Entire after period:									
Total	5,770	158	526	684				5,086	.0
Average	577	16	53	68	2.74	9.12	11.85	509	.0

TABLE XV.—*Solids balances for Series IX*—Continued.

[Averages are per day.]

No. 6.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	3,019	130	249	379	.....	.....	.....	2,640	0.0
Average	604	26	50	76	4.31	8.25	12.55	528	.0
Second subperiod:									
Total	2,977	155	285	440	.....	.....	.....	2,537	.0
Average	595	31	57	88	5.21	9.57	14.78	507	.0
Entire fore period:									
Total	5,996	285	534	819	.....	.....	.....	5,177	.0
Average	600	29	53	82	4.75	8.91	13.66	518	.0
Preservative period.									
First subperiod:									
Total	3,040	118	266	384	.....	.....	.....	2,656	.50
Average	608	24	53	77	3.88	8.75	12.63	531	.10
Second subperiod:									
Total	2,924	134	270	404	.....	.....	.....	2,520	1.00
Average	585	27	54	81	4.58	9.23	13.82	504	.20
Third subperiod:									
Total	3,049	103	262	365	.....	.....	.....	2,684	.70
Average	610	21	52	73	3.38	8.59	11.97	537	.14
Entire preservative period:									
Total	9,013	355	798	1,153	.....	.....	.....	7,860	2.20
Average	601	24	53	77	3.94	8.85	12.79	524	.15
After period.									
First subperiod:									
Total	3,097	103	254	357	.....	.....	.....	2,740	.0
Average	619	21	51	71	3.33	8.20	11.53	548	.0
Second subperiod:									
Total	3,010	112	261	373	.....	.....	.....	2,637	.0
Average	602	22	52	75	3.72	8.67	12.39	527	.0
Entire after period:									
Total	6,107	215	515	730	.....	.....	.....	5,377	.0
Average	611	22	52	73	3.52	8.43	11.95	538	.0

TABLE XV.—*Solids balances for Series IX*—Continued.

[Averages are per day.]

No. 7.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	[a]3,013	130	[a]308	438	.....	.....	.....	2,575	0.0
Average	603	26	62	88	4.31	10.22	14.54	515	.0
Second subperiod:									
Total	3,041	130	308	438	.....	.....	.....	2,603	.0
Average	608	26	62	88	4.27	10.13	14.40	520	.0
Entire fore period:									
Total	6,054	260	616	876	.....	.....	.....	5,178	.0
Average	605	26	62	88	4.29	10.18	14.47	517	.0
Preservative period.									
First subperiod:									
Total	3,127	103	298	401	.....	.....	.....	2,726	.50
Average	625	21	60	80	3.29	9.53	12.82	545	.10
Second subperiod:									
Total	2,949	93	301	394	.....	.....	.....	2,555	1.00
Average	590	19	60	79	3.15	10.21	13.36	511	.20
Third subperiod:									
Total	3,047	105	277	382	.....	.....	.....	2,665	1.00
Average	609	21	55	76	3.45	9.12	12.54	533	.20
Entire preservative period:									
Total	9,123	301	876	1,177	.....	.....	.....	7,946	2.50
Average	608	20	58	78	3.30	9.60	12.90	530	.17
After period.									
First subperiod:									
Total	3,036	37	265	302	.....	.....	.....	2,734	.0
Average	607	7	53	60	1.22	8.73	9.95	547	.0
Second subperiod:									
Total	2,983	133	300	433	.....	.....	.....	2,550	.0
Average	597	27	60	87	4.46	10.06	14.52	510	.0
Entire after period:									
Total	6,019	170	565	735	.....	.....	.....	5,284	.0
Average	602	17	57	74	2.82	9.39	12.21	528	.0

[a] Average for one day added to complete record.

TABLE XV.—*Solids balances for Series IX*—Continued.

[Averages are per day.]

No. 8.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	3,523	148	325	473	.....	.....	.....	3,050	0.0
Average	705	30	65	95	4.20	9.23	13.43	610	.0
Second subperiod:									
Total	3,553	149	333	482	.....	.....	.....	3,071	.0
Average	711	30	67	96	4.19	9.37	13.57	615	.0
Entire fore period:									
Total	7,076	297	658	955	.....	.....	.....	6,121	.0
Average	708	30	66	96	4.20	9.30	13.50	612	.0
Preservative period.									
First subperiod:									
Total	3,606	148	340	488	.....	.....	.....	3,118	.50
Average	721	30	68	98	4.10	9.43	13.53	623	.10
Second subperiod:									
Total	3,534	148	344	492	.....	.....	.....	3,042	1.00
Average	707	30	69	98	4.19	9.73	13.92	609	.20
First and second subperiods:									
Total	7,140	296	684	980	.....	.....	.....	6,160	.15
Average	714	30	68	98	4.15	9.58	13.73	616	.15

TABLE XV.—*Solids balances for Series IX*—Continued.

[Averages are per day.]

No. 10.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	2,946	97	321	418	.....	.....	.....	2,528	0.0
Average	589	19	64	84	3.29	10.90	14.19	505	.0
Second subperiod:									
Total	3,041	131	332	463	.....	.....	.....	2,578	.0
Average	608	26	66	93	4.31	10.92	15.23	515	.0
Entire fore period:									
Total	5,987	228	653	881	.....	.....	.....	5,106	.0
Average	599	23	65	88	3.81	10.91	14.72	511	.0
Preservative period.									
First subperiod:									
Total	3,129	126	331	457	.....	.....	.....	2,672	.50
Average	626	25	66	91	4.03	10.58	14.61	535	.10
Second subperiod:									
Total	2,964	98	324	422	.....	.....	.....	2,542	1.00
Average	593	20	65	84	3.31	10.93	14.24	509	.20
Third subperiod:									
Total	2,509	93	289	382	.....	.....	.....	2,127	.70
Average	502	19	58	76	3.71	11.52	15.23	426	.14
Entire preservative period:									
Total	8,602	317	944	1,261	.....	.....	.....	7,341	2.20
Average	573	21	63	84	3.69	10.97	14.66	489	.15
After period.									
First subperiod:									
Total	3,053	121	336	457	.....	.....	.....	2,596	.0
Average	611	24	67	91	3.96	11.01	14.97	520	.0
Second subperiod:									
Total	3,027	120	335	455	.....	.....	.....	2,572	.0
Average	605	24	67	91	3.96	11.07	15.03	514	.0
Entire after period:									
Total	6,080	241	671	912	.....	.....	.....	5,168	.0
Average	608	24	67	91	3.98	11.04	15.00	517	.0

TABLE XV.—*Solids balances for Series IX*—Continued.

[Averages are per day.]

No. 11.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	3,107	120	265	385				2,722	0.0
Average	621	24	53	77	3.86	8.53	12.39	544	.0
Second subperiod:									
Total	3,213	113	297	410				2,803	.0
Average	643	23	59	82	3.52	9.24	12.76	561	.0
Entire fore period:									
Total	6,320	233	562	795				5,525	.0
Average	632	23	56	80	3.69	8.89	12.58	552	.0
Preservative period.									
First subperiod:									
Total	3,294	95	307	402				2,892	.50
Average	659	19	61	80	2.88	9.32	12.20	579	.10
Second subperiod:									
Total	3,110	96	302	398				2,712	1.00
Average	622	19	60	80	3.09	9.71	12.80	542	.20
Third subperiod:									
Total	3,213	120	293	413				2,800	1.00
Average	643	24	59	83	3.73	9.12	12.85	560	.20
Entire preservative period:									
Total	9,617	311	902	1,213				8,404	2.50
Average	641	21	60	81	3.23	9.38	12.61	560	.17
After period.									
First subperiod:									
Total	3,176	116	309	425				2,751	.0
Average	635	23	62	85	3.65	9.73	13.38	550	.0
Second subperiod:									
Total	3,165	119	322	441				2,724	.0
Average	633	24	64	88	3.76	10.17	13.93	545	.0
Entire after period:									
Total	6,341	235	631	866				5,475	.0
Average	634	24	63	87	3.71	9.95	13.66	547	.0

TABLE XV.—*Solids balances for Series IX*—Continued.

[Averages are per day.]

No. 12.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	3,314	135	325	460				2,854	0.0
Average	663	27	65	92	4.07	9.81	13.88	571	.0
Second subperiod:									
Total	3,316	152	299	451				2,865	.0
Average	663	30	60	90	4.58	9.02	13.60	573	.0
Entire fore period:									
Total	6,630	287	624	911				5,719	.0
Average	663	29	62	91	4.33	9.41	13.74	572	.0
Preservative period.									
First subperiod:									
Total	3,365	187	350	537				2,828	.50
Average	673	37	70	107	5.56	10.40	15.96	566	.10
Second subperiod:									
Total	3,209	112	320	432				2,777	1.00
Average	642	22	64	86	3.49	9.97	13.46	556	.20
Third subperiod:									
Total	3,312	114	327	441				2,871	1.00
Average	662	23	65	88	3.44	9.87	13.32	574	.20
Entire preservative period:									
Total	9,886	413	997	1,410				8,476	2.50
Average	659	28	66	94	4.18	10.08	14.26	565	.17
After period.									
First subperiod:									
Total	3,286	113	333	446				2,840	.0
Average	657	23	67	89	3.44	10.13	13.57	568	.0
Second subperiod:									
Total	3,284	100	340	440				2,844	.0
Average	657	20	68	88	3.05	10.35	13.40	569	.0
Entire after period:									
Total	6,570	213	673	886				5,684	.0
Average	657	21	67	89	3.24	10.24	13.49	568	.0

TABLE XV.—*Solids balances for Series IX*—Continued.

SUMMARIES.

[Averages are per man per day.]

Nos. 1 to 6.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	17,763	685	1,614	2,299	3.86	9.09	12.94	15,464	0.0
Average	592	23	54	77	.....	.....	.....	515	.0
Second subperiod:									
Total	18,032	694	1,724	2,418	3.85	9.56	13.41	15,614	.0
Average	601	23	57	81	.....	.....	.....	520	.0
Entire fore period:									
Total	35,795	1,379	3,338	4,717	3.85	9.33	13.18	31,078	.0
Average	597	23	56	79	.....	.....	.....	518	.0
Preservative period.									
First subperiod:									
Total	18,366	668	1,723	2,391	3.64	9.38	13.02	15,975	3.00
Average	612	22	57	80	.....	.....	.....	532	.10
Second subperiod:									
Total	17,504	618	1,716	2,334	3.53	9.80	13.33	15,170	6.00
Average	583	21	57	78	.....	.....	.....	505	.20
Third subperiod:									
Total	18,248	713	1,705	2,418	3.91	9.34	13.25	15,830	5.70
Average	608	24	57	81	.....	.....	.....	527	.19
Entire preservative period:									
Total	54,118	1,999	5,144	7,143	3.69	9.51	13.20	46,975	14.70
Average	601	22	57	79	.....	.....	.....	522	.16
After period.									
First subperiod:									
Total	18,068	643	1,677	2,320	3.56	9.28	12.84	15,748	.0
Average	602	21	56	77	.....	.....	.....	525	.0
Second subperiod:									
Total	17,781	721	1,737	2,458	4.05	9.77	13.82	15,323	.0
Average	593	24	58	82	.....	.....	.....	511	.0
Entire after period:									
Total	35,849	1,364	3,414	4,778	3.80	9.52	13.33	31,071	.0
Average	597	23	57	80	.....	.....	.....	517	.0

TABLE XV.—*Solids balances for Series IX*—Continued.

SUMMARIES—Continued.

[Averages are per man per day.]

Nos. 7, 10, 11, and 12.

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	12,380	482	1,219	1,701	3.89	9.85	13.74	10,679	0.0
Average	619	24	61	85	.....	.....	.....	534	.0
Second subperiod:									
Total	12,611	526	1,236	1,762	4.17	9.80	13.97	11,849	.0
Average	631	26	62	88	.....	.....	.....	543	.0
Entire fore period:									
Total	24,991	1,008	2,455	3,463	4.03	9.82	13.86	21,528	.0
Average	625	25	61	87	.....	.....	.....	538	.0
Preservative period.									
First subperiod:									
Total	12,915	511	1,286	1,797	3.96	9.96	13.91	11,118	2.00
Average	646	26	64	90	.....	.....	.....	556	.10
Second subperiod:									
Total	12,232	399	1,247	1,646	3.26	10.19	13.46	10,586	4.00
Average	612	20	62	82	.....	.....	.....	530	.20
Third subperiod:									
Total	12,081	432	1,186	1,618	3.58	9.82	13.39	10,463	3.70
Average	604	22	59	81	.....	.....	.....	523	.19
Entire preservative period:									
Total	37,228	1,342	3,719	5,061	3.60	9.99	13.59	32,167	9.70
Average	620	22	62	84	.....	.....	.....	536	.16
After period.									
First subperiod:									
Total	12,551	387	1,243	1,630	3.08	9.90	12.99	10,921	.0
Average	628	19	62	82	.....	.....	.....	546	.0
Second subperiod:									
Total	12,459	472	1,297	1,769	3.79	10.41	14.20	10,690	.0
Average	623	24	65	88	.....	.....	.....	535	.0
Entire after period:									
Total	25,010	859	2,540	3,399	3.43	10.16	13.59	21,611	.0
Average	625	21	64	85	.....	.....	.....	540	.0

TABLE XV.—*Solids balances for Series IX*—Continued.

SUMMARIES—Continued.

[Averages are per man per day.]

Nos. 1 to 12 (omitting Nos. 8 and 9).

Period.	1 In food.	2 In feces.	3 In urine.	4 In feces and urine (2+3).	5 In feces (2÷1).	6 In urine (3÷1).	7 In feces and urine (4÷1).	8 Balance (1−4).	9 Formaldehyde administered.
Fore period.									
First subperiod:	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Grams.*
Total	30,143	1,167	2,833	4,000	3.87	9.40	13.27	26,143	0.0
Average	603	23	57	80	.....	.....	.....	523	.0
Second subperiod:									
Total	30,643	1,220	2,960	4,180	3.98	9.66	13.64	26,463	.0
Average	613	24	59	84	.....	.....	.....	529	.0
Entire fore period:									
Total	60,786	2,387	5,793	8,180	3.93	9.53	13.46	52,606	.0
Average	608	24	58	82	.....	.....	.....	526	.0
Preservative period.									
First subperiod:									
Total	31,281	1,179	3,009	4,188	3.77	9.62	13.39	27,093	5.00
Average	626	24	60	84	.....	.....	.....	542	.10
Second subperiod:									
Total	29,736	1,017	2,963	3,980	3.42	9.96	13.38	25,756	10.00
Average	595	20	59	80	.....	.....	.....	515	.20
Third subperiod:									
Total	30,329	1,145	2,891	4,036	3.78	9.53	13.31	26,293	9.40
Average	607	23	58	81	.....	.....	.....	526	.19
Entire preservative period:									
Total	91,346	3,341	8,863	12,204	3.66	9.70	13.36	79,142	24.40
Average	609	22	59	81	.....	.....	.....	528	.16
After period.									
First subperiod:									
Total	30,619	1,030	2,920	3,950	3.36	9.54	12.90	26,669	.0
Average	612	21	58	79	.....	.....	.....	533	.0
Second subperiod:									
Total	30,240	1,193	3,034	4,227	3.95	10.03	13.98	26,013	.0
Average	605	24	61	85	.....	.....	.....	520	.0
Entire after period:									
Total	60,859	2,223	5,954	8,177	3.65	9.78	13.44	52,682	.0
Average	609	22	60	82	.....	.....	.....	527	.0

SUMMARY OF RESULTS.

MEDICAL AND CLINICAL DATA.

The formaldehyde in the quantities administered did not produce any marked symptoms until the third preservative subperiod, a lapse of ten days; then headache and pain in the stomach and intestines became general, in many cases producing cramps, and in a few cases attended by nausea and vomiting. Only two exceptions are noted. A burning sensation in the throat was reported in the majority of cases. In four cases out of eleven a well marked itching rash appeared on the chest and thighs, causing great discomfort, slight symptoms of this nature being reported in a fifth case. The general symptoms, therefore, are headache and abdominal pains, while a slight tendency to lower the temperature may be noted as a

minor symptom, and the development of the rash, though marked, occurs in only about half of the cases.

It is important to observe that in the case of healthy young men it requires some time for this drug to produce an effect noticeable in a symptomatic way, as above described. That no effect is produced, however, until after ten days would not be a logical conclusion. It is evident that the system is able for some time to control the development of conditions which later become pronounced, but that no ill effects are produced prior to that time is not probable. After ten days, however, ten cases out of twelve develop marked symptoms of malaise, intestinal trouble and distress, and, in many cases, positive symptoms of a local character, such as the rash which has been mentioned. The apparent tendency to lower the temperature is mentioned as one of the symptoms, but inasmuch as no special investigation was made in this respect it is advisable that further studies be prosecuted before positive statements are made, yet it is not without signification that this unexpected condition of affairs was noticed, and also that there was a tendency to its continuation in some instances into the after period.

BODY WEIGHT.

There is a slight tendency shown in the case of those subjects receiving the formaldehyde directly in milk to a loss of body weight under the administration of the preservative amounting to 0.2 kilogram per day for each man, while in the case of the subjects receiving milk preserved for forty-eight hours there does not appear to be any noteworthy decrease in the body weight until the after period, when an average loss of 0.5 kilogram is recorded.

The ratio of food weight to the body weight is practically constant throughout the experiment. These changes in weight are of interest as correlated with the corresponding increase in volume of the urine and moisture in the feces, and as contrasted with the tendency to decrease the excretion of the principal food elements studied.

WEIGHT AND WATER CONTENT OF THE FECES.

These data show, in the case of the subjects receiving formaldehyde directly, an increase in moisture amounting to 2 per cent and a slight decrease (1 gram per day) in the amount of dry feces excreted. In the case of the subjects receiving the preservative forty-eight hours after it had been added to the milk there is a decrease both in the moisture content and in the weight of dry matter excreted, amounting to 1.6 per cent and 3 grams daily, respectively, this decrease being further augmented in the after period. There is thus shown a slight derangement of the normal processes, which is unfavorable and probably has some bearing on the loss of body weight.

URINE.

VOLUME, SPECIFIC GRAVITY, AND TOTAL SOLIDS.

The data in the case of the direct administration of the preservative (Nos. 1 to 6) show an increase in the volume of the urine excreted, accompanied by a slight decrease in its specific gravity and practically no change in the amount of solids excreted. The same condition prevails in the case of the indirect administration, though it is less marked during the preservative period and more so in the after period.

There is in general, therefore, a tendency to slight diuresis and a decrease in specific gravity under the administration of the preservative, while practically no effect is produced on the excretion of total solids. It is interesting to note the connection between these increases in volume of urine excreted and the losses in body weights. The increase in volume for Nos. 1 to 6 and the decrease in weight occur during the preservative period, while for Nos. 7, 10, 11, and 12 these conditions are both more marked in the after period.

ALBUMIN AND REACTION.

From the somewhat limited data at hand no definite conclusions can be drawn regarding the presence of albumin in the urine or the acidity thereof. There is, however, in a few instances an apparent tendency to produce albumin, and in general during the administration of the formaldehyde there is a tendency to decrease the normal acidity. Considering the action of formaldehyde in general on secretions, especially the digestive secretions, this observation is in accordance with that of others who have shown that changes in the gastric juice are accompanied by corresponding changes in the acidity of the urine, an increased secretion of acid producing a decrease in the acidity of the urine. These two conditions have an important physiological bearing on the normal functions of the body, and such a derangement must be regarded as harmful or at least as leading to harmful results.

CHANGES IN THE RELATIVE EXCRETION OF SULPHUR COMPOUNDS.

In the case of the direct administration of the preservative there is a slight tendency manifested to derange the normal relations of the compounds of sulphur excreted during the preservative period. There is a decrease in the neutral sulphur amounting to a little over 1 per cent of the total sulphur eliminated and a slight increase in the inorganic sulphates, while the ethereal sulphates remain practically the same throughout. For those subjects who received the preservative after it had stood in milk for two days there is seen an increase

in the quantity of neutral sulphur excreted amounting to about 1.4 per cent, accompanied by a slight decrease in the inorganic sulphates, while again the ethereal sulphates remain constant.

These data alone show evidence of an increased sulphur metabolism in the case of Nos. 1 to 6 and a retardation in the case of Nos. 7 to 12, though the excretion of total sulphur shows practically no change.

NITROGEN METABOLISM.

A remarkably uniform tendency is manifested, in regard to the metabolism of the nitrogen of the food, to increase slightly its assimilation and to retard the breaking-down processes in the cells. The stimulating of assimilation is in accordance with the observations of numerous authors who ascribe to formaldehyde the power of exciting digestive secretions, its influence on the pancreatic and biliary secretions being very marked. On the other hand, formaldehyde has a retarding effect on the digestive enzymes which in this case appears not to have been so marked as the stimulating effects exerted on the digestive juices themselves. The decrease in the metabolized nitrogen excreted, in connection with the loss of weight, contraindicates any increase in the anabolic processes. Apparently the same effect is produced by the formaldehyde on the nitrogen metabolism when it is added directly to the milk and when it has stood in contact with it for two days, though in the latter case it is somewhat more marked.

PHOSPHORIC ACID METABOLISM.

There is an unmistakable tendency shown to derange the metabolism of phosphoric acid, which again is manifested to practically the same extent under the two conditions of the experiment. There is a slightly increased absorption of the phosphorus compounds from the alimentary canal, accompanied by a marked increase in the excretion of metabolized phosphoric acid, amounting to over 4 per cent. There is only one exception to this increased excretion in the individual data, namely, No. 7, in which case an abnormal excretion of phosphoric acid was recorded in the fore period.

The balances are decreased in all cases except No. 7—a condition which is quite abnormal in the case of phosphoric acid and can not be regarded as other than an unfavorable effect, which would ultimately produce harmful results.

SULPHUR METABOLISM.

In the sulphur metabolism the same conditions are shown to exist as were found in the case of nitrogen, namely, a tendency to increase the absorption of the sulphur constituents of the food and retard the normal katabolic activities. The decrease in nonmetabolized sulphur

is a little over 1 per cent in both cases, while the decrease in metabolized sulphur excreted amounts to 4.6 per cent for Nos. 1 to 6 and 2.7 per cent for Nos. 7 to 12. There is almost as close an individual agreement shown in this case as in the previous balances, and there is no marked difference between the summaries for those taking the formaldehyde directly and those to whom it was given in milk preserved for two days.

TABLE XVI.—*Comparative summary of principal determinations made. Series IX.*

[Averages are per man per day.]

Data.	Formaldehyde (Nos. 1–6).			Formaldehyde (Nos. 7–12).[a]		
	Fore period.	Preservative period.	After period.	Fore period.	Preservative period.	After period.
Temperature (°F.)	98.3	98.0	98.1	98.4	98.3	98.1
Body weight (kilos)	63.50	63.27	63.27	63.01	62.93	62.43
Composition of feces:						
Weight (grams)	101.00	108.00	103.00	116.00	96.34	91.00
Water content (per cent)	77.35	79.45	77.87	78.34	76.78	76.46
Dry matter (grams)	23.00	22.60	23.00	25.00	22.00	21.00
Urine:						
Volume (cc)	970.00	1,085.00	1,062.00	1,170.00	1,191.00	1,309.00
Microscopic sediments (per cent figures for relative occurrence)[b]				63.6	70.00	72.7
Sulphur (as SO_3) (grams)—						
Neutral	.231	.202	.193	.246	.279	.217
Inorganic	1.859	1.872	1.822	2.035	2.001	2.089
Ethereal	.143	.141	.146	.143	.143	.141
Total	2.232	2.215	2.161	2.424	2.423	2.446
Metabolism (percentage results):						
Nitrogen—						
Nonmetabolized (feces)	9.67	9.27	9.71	9.94	8.81	8.62
Metabolized (urine)	82.92	81.50	80.54	85.02	82.62	85.74
Phosphoric acid—						
Nonmetabolized (feces)	30.93	29.27	31.78	33.24	29.12	30.32
Metabolized (urine)	59.71	64.43	63.06	60.46	64.88	64.60
Sulphur—						
Nonmetabolized (feces)	12.26	11.06	12.70	12.54	10.96	10.98
Metabolized (urine)	78.35	73.78	78.41	79.34	76.61	81.96

[a] Omitting Nos. 8 and 9; formaldehyde added to milk 48 hours before administration.
[b] Summary for Nos. 1–12, omitting Nos. 8 and 9.

GENERAL CONCLUSIONS.

A general study of all of the data leads to the conclusion that the admixture of formaldehyde with food is injurious to health, even in the case of healthy young men. It is fair to conclude, therefore, that in the case of infants and children the deleterious effects would be more pronounced. The metabolic functions are disturbed in a notable way, both by the retardation of the nitrogen and sulphur metabolism and the acceleration of phosphorus metabolism. There seems to be a tendency to an increased absorption from the alimentary canal, especially in the cases when the formaldehyde had stood in contact with the milk, and hence it is fair to presume that in so far as the digestive action in the intestinal canal is concerned, transforming solid food into soluble materials which may enter the circulation, there is evidently a stimulating effect produced.

There are, however, many varying conditions which must be considered in properly interpreting the data. The uniformly increased absorption of the proteid elements of the food, and also of the sulphur and phosphoric acid, accompanied in the first two instances by a decrease in the metabolized elements excreted, and in the last instance, namely, phosphoric acid, by a pronounced increase in metabolism, makes the explanation of the data rather difficult. Attention should be called to the fact that while the variations from normal metabolism are not very wide the individual data are remarkably uniform and consistent.

The conditions which are noted in the case of the proteins would lead one to expect a gain in the body weight. This expectation, however, is not realized for either class of subjects, although the losses in weight are so slight as to be practically negligible. The ratio of the food weight to the body weight was uniformly maintained throughout the experiment, and hence if no variations in metabolic activity had occurred a fair presumption would have been that the body weight would remain constant. That the change of weight was slight in view of the disturbances of the metabolic functions may be accounted for by the inhibiting or retarding influence of the preservative upon the nitrogen and sulphur katabolism or by the slight increase in water in the urine and feces. It can not be maintained, however, that a retarded katabolism is beneficial to health. On the contrary, a more rapid renewal of the tissues within the limits of healthy activity would be more likely to preserve a normal condition. The old tissues can not be expected to functionate as perfectly as those which are newer, and hence, within reasonable limits, a change of the tissues of the body must be considered as necessary to a healthy condition and the maintenance of a normal vitality.

The medical data indicate plainly that formaldehyde, even when given in small quantities, is an irritating substance to the mucous membrane, and therefore the normal organs are at first actively stimulated to rid themselves of the irritating foreign substance. It is not strange, therefore, that this preservative had a marked stimulative action on those organs and cells secreting the various digestive juices. It is evident that when the digestive and excretory organs of the body are excited to unusual activity by such an extraneous body having neither food nor condimental value, they act in self-defense, and it would be wholly illogical to conclude from this increased excitation that these bodies were helpful to digestion and conducive to health. The nature of the investigation made it impossible to determine whether any organic change took place in the various organs affected, but it may be assumed that any such change which these organs had undergone in the limited time was not sufficient to disturb in any notable

way their normal functions, which they would perform until the continued administration of the drug produced disease due to the excessive stimulation.

In the case of phosphoric acid, the increased katabolic activity is difficult of definite interpretation, though it is established beyond doubt that such an effect is produced. The formaldehyde may exert a selective action for those proteid bodies high in phosphorus, rendering them insoluble, but in this case there would be an excess of phosphorus in the feces, which is not found. Or the formaldehyde may induce a change in the process of digestion whereby the phosphorus of the food is changed into a soluble and easily excreted form without passing through the tissues of the body. This might easily be the case if in the process of digestion the glycerol-phosphoric acid formed is transformed into soluble inorganic salts, which are readily excreted. Whatever may be the explanation, the changes indicated in normal metabolism, accompanied as they are by the development of the symptoms described, can only be considered as prejudicial to health.

The general tendency to produce a slight decrease in the temperature of the body, assuming for the moment that the data warrant the conclusions that such a condition of affairs existed, might well be due to the inhibition of cell activity shown by the retardation in the breaking down of tissues. The normal functions of the body would doubtless be disturbed by such a condition, aside from the irritating and other disturbing influences exerted by the ingested drug.

The tendency of the preservative to produce albumin in the urine, while not well marked, is at least worthy of mention. The fact that only slight changes take place in the body weight is sufficiently explained by the data and can not be urged in favor of the exhibited preservative.

The final conclusion, therefore, is that the addition of formaldehyde to foods tends to derange metabolism, disturb the normal functions, and produce irritation and undue stimulation of the secretory activities, and therefore it is never justifiable.

LIST OF TABLES.

SERIES IX.